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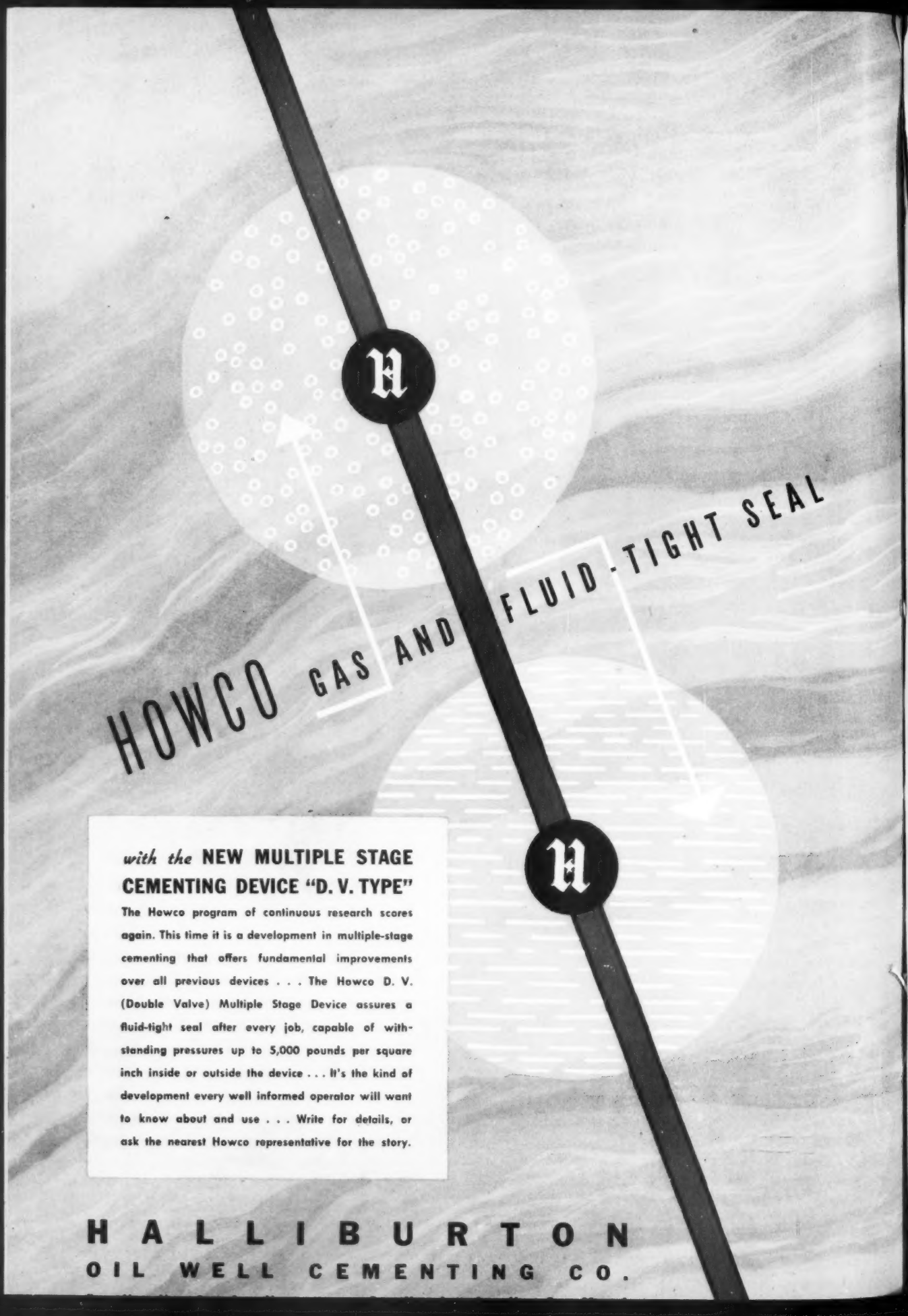
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Table of Contents

NEWS DEVELOPMENTS

Research in Secondary Recovery Urged on Interstate Compact 66
Krug Tells Compact Substantial Oil Imports Will Be Needed 67
FTC Refuses Reconsideration of Indiana Standard Order 70
OPA-RFC Disagreement Holding Up Subsidy Decision 70
California Standard Plans Interest in Jersey Plant 71
U. S., Britain Planning Talks on Multilateral Oil Agreement 71
Oil in United States' Foreign Policy 74
East Coast Residual Prices Stabilized at Lower Level 83
Deaths in the Industry 83
Mississippi Board Studies 75-Bbl. Heidelberg Allowable 83
A.P.I. Directors' Meeting to Be Held in Washington 83

Editorial 65
This Week 69
International News 72
Watching Washington 80
Refining News 126
Pipe-Line News 131
Natural-Gas News 135
Natural-Gasoline News 135

ENGINEERING AND OPERATING

Continental Oil Co. Streamlines Wichita Falls Refinery 84
Unusual Pressure Is Solved in Triple-Zone Completion 87
Engineering Factors in East Texas Salt-Water Disposal 89
Chemical Health Hazards in Modern Petroleum Refining 95
Drilling Time Reduced in Permian Basin 108
Book Reviews 112
Engineering Fundamentals 115
The Refiner's Notebook 117
Oil and Gas Equipment Digest 121

EXPLORATION AND DRILLING

Weekly Well-Completion Record 138
Daily Average Production for Week 139
Arkansas Discovery Looks Good 141
Reports by Areas Start on Page 141

ADDITIONAL FEATURES

Market Summary 138
Crude-Oil Prices 138
Drilling Contractors 162
Personals 164
Men in Equipment News 167
Classified Advertising 169
Calendar of Events 172
Advertisers' Index 172

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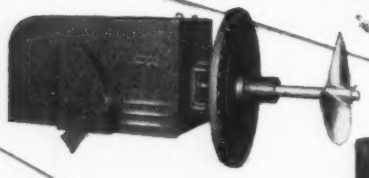

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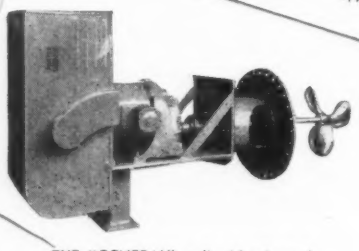

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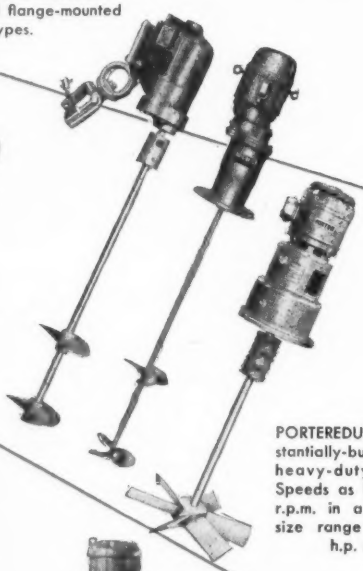

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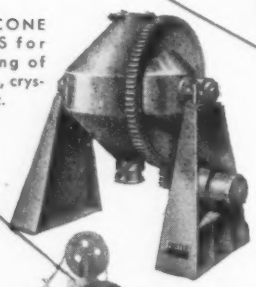

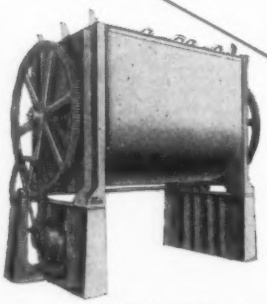

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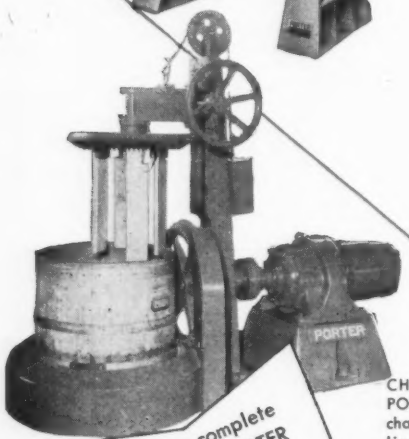

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THE OIL AND GAS JOURNAL

Mr. Krug Speaks

SECRETARY OF INTERIOR KRUG at the Interstate Oil Compact meeting last week presented what can be interpreted as the petroleum policy of the present administration. The program, as regards basic assumptions, is consistent in most details with that of his predecessor.

The secretary has been at his present job long enough that he is impressed with the fact that while this country has nearly two-thirds of the total oil consumption, it has a much smaller percentage of the known proven reserves. He concludes that the oil business in this country "must soon accommodate its thinking to the need for substantial imports which can serve to increase our security without any threat whatever to a healthy domestic industry." No one will quarrel with the new secretary as to his objectives of security and a strong domestic industry.

We have had petroleum imports supplementing domestic supplies for many years. But the U. S. industry was always self-sufficient as demonstrated again in World War II when domestic fields and plants supplied the bulk of the increased Allied needs. But a new program in which there would be a permanent substantial dependence on oil from other countries is something else and involves changes of far-reaching importance in international and national policies. The man in the street, confused by developments in international relations during the first postwar year, will want assurance relative to several matters before he approves a plan in which his country will become dependent on outside oil supplies.

The secretary's recognition of the necessity of a healthy domestic industry is encouraging. Presumably that means the continuance of a free enterprise under state regulations with operators given every encouragement, including prices, to enlarge exploration, secure maximum recoveries, expand the lowest cost transportation, and increase refinery yield and further improve quality of finished products—all factors in conservation.

Mr. Krug says these conservation programs will not be sufficient to assure this country adequate petroleum supplies. But actually neither he nor anyone knows what can be accomplished during the next decade and longer in the light of recent research and development which over the next 2 years will be aided by the largest laboratory facilities of any industry. Scientists and engineers know more about what the future holds in domestic petroleum supply than anyone else but they are more inclined to deeds than prophecy.

The federal head of petroleum policy has served the industry by explaining frankly what he believes his duties to be. The oil business should now make its position equally clear to the end that through mutual understanding and agreement a sound petroleum program will be effected.

Research in Secondary Recovery Urged on Interstate Compact

by Arch L. Foster

GRAND RAPIDS, Mich.—The urgency for expansion of the research program of the producing branch of the oil industry was emphasized strongly at the summer quarterly meeting of the Interstate Oil Compact Commission here August 8-10.

A research program should be worked out and followed by the producing industry which would be comparable to the tremendous programs now being carried out by the refining branch, by the chemical and other industries, Don T. Andrus, Pennsylvania independent producer and commission representative from that state proposed as a solution for any threatened shortage of petroleum reserves in this country or elsewhere.

Andrus' proposal included an educational campaign to enlighten the country and the oil states of the real condition of our oil reserves, an all-out effort for an oil price which will finance a reasonable conservation program, pressure on oil-state authorities for more effective conservation laws, and encouragement and coordination of a research program. "This type of program, carried out with the abundant ingenuity the American oil industry possesses," Andrus said, "is our surest defense against the fate which has befallen private industry in England."

Michigan exploratory operations are complicated by the surface and shallow conditions caused by glacial ice caps which covered that state several times in past epochs, P. J. Hoffmaster, supervisor for wells of the state, mentioned in discussing their operations. Nevertheless, exploration is continuing at an unabated rate, he said.

Urge Curtailment of Crude Production

The oil industry should adjust its operations immediately to meet current crude requirements without excess additions to stocks of either crude or refined products, the Independent Petroleum Association of America urged at the meeting. Large importing companies should be called on to reduce their oil imports to a "fair proportion of total demand" in accordance with domestic production reductions, the association said. Petroleum supplies have been in excess of consumptive demands, it was stated; July production is expected to exceed demand by 250,000 bbl. No action was taken at the meeting on this report.

The paper by Secretary of the Interior Krug, urging greater efforts toward conservation and increase in the amount of crude imported was presented Saturday morning. Important phases of Krug's speech are presented on the opposite page.

No Action on Anglo-American Treaty

In addition, the compact discussed or took action on several matters including:

1. Georgia was admitted as the first associate compact member following approval changes in bylaws to admit as associate members states having no oil production but good prospects.

2. The governor of Tennessee will sponsor a bill in the next legislature to make that state a member of the compact P. S. Mathes, Tennessee director of conservation, announced at the meeting. Indiana probably will join the compact during the state's next legislative session.

3. The Anglo-American oil agreement was discussed Saturday, but no action was taken.

4. Proposals for secondary recovery research by Don T. Andrus were referred to the research and coordinating committee for study and report during the fall meeting. The fall meeting will be held probably in November in Texas, at a time and place to be fixed by the executive committee and dependent on hotel facilities.

5. Representatives of Illinois and Arkansas were named to the executive committee, bringing the membership to seven in accordance with the amended bylaws.

6. The commission's economics advisory committee recommended that a complete study be made of the character and available quantities of stocks of crude and products similar to the study now made by the Bureau of Mines of crude stocks. Richard I. Gonzales, chairman of the committee, said additions to stocks of all oils may exceed 100,000 bbl. daily during the third quarter. The stock study, he said, is advisable in view of the changes in industry operations since 1941 and the large stocks held in lines, tank bottoms, working tanks, terminals, and in transit.

7. The commission declined to take action on a proposed resolution asking Congress to create a permanent stripper-well subsidy. The plea of L. W. Johnston, appearing for the National Oil Conservation Committee, for support on a permanent subsidy, was backed by R. S. Kerr, Oklahoma governor, and chairman of the compact. The issue was kept alive for the fall compact meeting.

8. By its amended bylaws, the commission invited the President, Congress, and any federal agency charged with responsibility for petroleum matters to send representatives to commission meetings. Such representatives would take part in discussions and make recommendations but have no voting power.

Among those attending the Interstate Oil Compact Commission meeting held last week at Grand Rapids was this group of Michigan oil company officials and operators. Left to right: W. B. Pardoe, McClanahan Oil Co., Grand Rapids; Floyd A. Calvert, Pine Oil Co., Saginaw; P. J. Hoffmaster, Michigan Conservation director, Lansing; H. M. McClure, president, National Stripper Well Association, Alma; J. D. Wheeler, Ohio Oil Co., Grand Rapids

Krug Tells Compact Substantial Oil Imports Will Be Needed

by J. A. Krug
Secretary of the Interior

ALL of us have a stake in the further advances of petroleum technology and industrial operations. Uncertainty and doubt as to the policies of the various government authorities concerned with oil can only detract from the speed that can be made in reaching our objectives. It is, therefore, vital that the cardinal points of a national oil policy be laid down for examination, suggestion and review, to eliminate possible delay.

This policy must be coherent, must be forceful, and must be based upon fact. It must take into account immediate problems and establish guide posts for meeting future problems.

No national oil policy can be satisfactorily devised by a single group. Both the legislative and executive branches of federal and state governments must work together its its creation and must have the cooperation of the petroleum industry. In this I am confident that the industry will participate as wholeheartedly as it did during the war.

We must appraise our current oil assets in the light of our future needs and their relative worth in the world. During the war the United States produced nearly 6,000,000,000 bbl. of oil, or about one-fifth of the total amount produced in the United States in the last 85 years. Our proved reserves are approximately 21,000,000,000 bbl., while our annual consumption is now 1,700,000,000 bbl. with the likelihood of increasing demand. These figures emphasize that there is a need for action even though they do not mean that there is only enough crude oil to supply the country some 12 years.

Undoubtedly additional fields will be discovered to add to our current reserves, but if the trend of the past several years continues, the discovery of these new reserves will be much less rapid than formerly. A summary of expert opinion as to the quantity of oil we may hope to find through future exploration indicates that we have about reached the halfway mark in oil discovery in the United States. Finding the second half will take much longer, be much more difficult and far more costly.

Ultimate oil resources of the United States according to the experts will amount to about one-sixth of the total oil resources of the world, and we are producing and using about two-thirds of the world's oil. This means that oil will be scarce in the United States long before there is a comparable scarcity in other important producing areas.

The author, presenting the accompanying remarks at Grand Rapids meeting of I. O. C. C.

As an earnest indication of its sincere interest in the search for more oil reserves, the Congress very recently enacted a measure supported by members of the public lands committees, the petroleum industry and the Department of the Interior. The President this week signed S. 1236, making it law. Without taking your time now to detail its provisions, it is sufficient to point out that it improves the administrative practices involved in the leasing of government lands, and more important, it establishes the royalty rate at a flat 12½ per cent, thus giving impetus to the search for new oil.

A national oil policy must have three primary objectives: national oil security, the continued availability of an adequate, reasonably priced supply of petroleum products; and the maintenance of a healthy, vigorous American petroleum industry.

To achieve these objectives, specific needs must be met.

First, there must be a climate of economic circumstances which will assure a vigorous and healthy American oil industry. Second, the industry must be encouraged to intensify its exploration and its conservation activities, and to develop new techniques for producing additional oil from the stripper-well areas. Third, continued free access must be assured to the known reserves in the Caribbean, Persian Gulf, and other areas.

There has now been established within the Department of the Interior

The views of another federal official on the subject of national oil policy will be found under the International News on page 74 where the recent address of John A. Loftus, chief of the petroleum division of the State Department, is published.

Here are a few highlights from the address of J. A. Krug, secretary of the interior, at the Interstate Oil Compact Commission meeting, which is published, in abridged form, on these pages.

On the Tideland suit now before the Supreme Court:

"If the Supreme Court should decide that title is in the United States . . . it would be my hope . . . that neither the states nor their lessees would have to pay the federal Government any royalty or fees for the use of the land or the taking of the minerals during the period of doubt as to ownership."

On imports:

"I believe the industry must soon accommodate its thinking to the need for substantial petroleum imports which can increase our security without being any threat whatever to a healthy domestic industry."

On the Anglo-American treaty:

". . . the agreement contains no threat to the existing powers or the state or the federal Government in respect to domestic petroleum matters."

On conservation regulation:

"There is now no discernible need to shift the basic responsibility . . . from the states."

On a national oil policy:

"There must be a climate of economic circumstances which will assure a vigorous and healthy American oil industry . . . The industry must be encouraged to intensify its exploration and its conservation techniques . . . continued free access must be assured . . . the Caribbean, Persian Gulf, and other areas."

an Oil and Gas Division whose functions are to assist in the execution of the President's instructions, to serve as a central clearing house for statistics, technical data and other information relating to oil and gas, to keep currently information as to the adequacy and availability of petroleum and its products to meet the current and future needs of the nation, and to make recommendations with respect to these matters and other significant developments in the petroleum fields.

On June 17, 85 individuals from the petroleum industry, representative of its diverse interests, large and small, were appointed members of a newly created National Petroleum Council. A few days later the first meeting of this organization was held in Washington, a temporary chairman was appointed, and the way provided for the organization of the council on a permanent basis. I am convinced that this council can contribute in peacetime to the national welfare as much as did a similar arrangement during the war.

Today, with the demand for petroleum expanding there is no room for wasteful practices if we are adequately to protect our oil and gas supplies for the future. In its broadest sense the term "wasteful practices" also encompasses insufficient utilization. It is not enough not to cause loss in the process of extracting the oil from the ground, or in the cracking process, or in the distribution. Technological advances must also continue so that our engines consume less oil and its products, so that we get more out of the barrel of oil in actual performance than we do now.

Strengthen Conservation Laws

In these circumstances not only must the conservation laws of the states be continued but they should be strengthened to meet the needs of the future. The states which have not adopted adequate legislation to prevent the physical waste of oil and gas—and there are a number of important states in that position—should renew their efforts to enact the necessary laws.

Where inroads have been made upon effective administration or enforcement as a result of the dislocations caused by the war, prompt correction is in order; where advancing technical knowledge has made known the inadequacy of certain practices, adjustments should be made. In respect to the production of natural gas —a product assuming increasing significances as a fuel, as a source of important by-products, and as a raw material for synthetic fuels, lubricants and other hydrocarbon base compounds—it is important to examine the application of conservation measures. The question as to whether or not the Connally Act should be amended to include natural gas and the products derived from it, so that we could be of further help to the states in the enforcement of their conservation laws and regulations affecting natural gas is being studied at the present time.

There is now no discernible need to shift the basic responsibility for conservation r e g u l a t i o n from the states. A vast experience with conservation problems and a familiarity with local conditions make an effective state regulatory body the best organization to initiate and administer conservation codes. There can be no escaping, however, the very real interest that every American has in the oil and gas supply of the nation as a whole or the fact that this interest has from time to time led to demands for independent federal regulation. I cannot, however, believe that these demands for federal regulation will ever become very intense so long as there is effective administration of conservation regulations by the states themselves.

Develop New Techniques

We must continue to increase and make available our knowledge of reservoir behavior, develop and utilize new techniques of exploration, and further the growing interest in secondary recovery operations of all types. These are jobs which industry mainly must perform, but industry should be reassured of the very real interest which the federal and state governments have in the further expansion of this work.

We should proceed likewise to increase our knowledge and experience in the development of synthetic fuels against the day when we may have to turn to other sources than crude oil for our liquid hydrocarbon fuels. Already substantial steps have been taken in this direction by both industry and the federal Government.

One additional source of oil must not be overlooked—oil from land outside the continental United States. The fact is that during the height of the war our domestic oil production was insufficient to support the Army, Navy, and essential industrial and civilian activities, although some of our fields were producing in excess of maximum efficient rates. With the crucial national interest in the maintenance of adequate petroleum reserves, I believe the industry must soon accommodate its thinking to the need for substantial petroleum imports, which can serve to increase our security without being any threat whatever to a healthy domestic industry.

We cannot afford to wait until another emergency arises before provision is made for access to foreign sources of oil. It was the clear recognition of that fact which in part prompted the development of the Anglo-American Oil Agreement. I would not say that the agreement will provide the answers to all the problems which confront us in providing supplies of petroleum from foreign sources. It will, however, give us a mechanism through which many of the problems can be resolved and it establishes principles upon which lasting agreements can be based.

Certain legal arguments have been advanced against the treaty. There are valid answers to these arguments. I would like to emphasize that I believe that the agreement contains no threat to the existing powers of the state or federal governments in respect to domestic petroleum matters.

Policy on Submerged Lands

Within the past 2 weeks the President vetoed the resolution by which the Congress proposed to turn over to the states the federal interest in the submerged lands along our coasts and, as you all know, Congress sustained his veto. There is considerable confusion in the minds of some people, particularly those interested in oil, in the position of the executive branch of the government and more especially of the Department of the Interior on this matter.

The federal Government has never asserted title to or claimed ownership of lands underlying inland navigable streams or the coastal harbors or bays. That was not an issue, and the Government has frequently reiterated its lack of interest in such lands. However, there has always been a legal doubt as to the title of the lands beyond low tide on the open coast. As trustee for the people, the Department of the Interior felt it to be its duty to endeavor by appropriate means to find out who owned these lands and the minerals which they contain. The value of the lands and the minerals is believed to be great and thus a decision ought to be made quickly.

If the Supreme Court should decide that title is in the United States then it seems to me that Congress would want to establish a policy with regard to the development of these submerged lands. In that connection it would be my hope that the Congress would take into account that persons now holding leases from states or municipalities to the minerals in these lands would be protected in their rights to the extent that that is consistent with sound conservation practice, and that neither the states nor their lessees would have to pay to the federal Government any royalty or fees for the use of the land or the taking of the minerals during the period of doubt as to ownership.

These are the objectives for which we must strive—a sound oil policy based upon national oil security and wellbeing and a healthy vigorous American oil industry. Many steps that must be taken to achieve these objectives and many problems must be met and solved.

THIS 1946 WEEK

S	M	T	W	T	F	S

REGULATION— Secretary of Interior Krug in speech before Interstate Oil Compact Commission declares industry must reconcile itself to substantial imports which, he says, will not threaten a healthy domestic industry. . . . Also asserts "no discernible need" now exists to shift responsibility for conservation regulation away from states. . . . Position on imports in first major address directed to oil industry expected to develop considerable opposition. . . . ¶At Grand Rapids meeting, compact hears recommendation of economics advisory committee for complete study of all petroleum stocks. . . . Defers action on proposal to indorse plan for permanent stripper subsidy. . . . Invites federal Government agencies charged with oil responsibility to send representatives to future compact meetings. . . . ¶New York reports say U. S. State Department, British Government planning new discussions before December on multilateral petroleum agreement which would embrace all producing and consuming countries. . . .

PRICES— The undecided question of future stripper subsidy continues to hold attention. . . . Decision on August payments expected this week. . . . Disagreement reported between OPA and RFC which was taken to Office of War Mobilization and Reconversion for settlement. . . . OPA reported favoring progressive one-third reductions below June payments with RFC suggesting limiting subsidy to wells with less than 5-bbl. daily output. . . . ¶Washington observers see little chance new Price Decontrol Board will reinstitute oil controls. . . . Under law, petroleum remains free of controls unless positive action is taken to reinstate them. . . . ¶OPA officials in quandary over whether specialty and chemical products, made in part from petroleum, come under the Moore amendment.

INTERNATIONAL—Talk by John A. Loftus, petroleum chief for State Department, stirs discussion on government policy on foreign prospecting. . . . Department represented as favoring search abroad by small companies. . . . ¶Trans-Arabian Pipe Line gets right-of-way through Trans-Jordan from Government for $250,000 annually. . . . ¶Saudi Arabia borrows $10,000,000 from Export-Import Bank, secures loan by assignment of Arabian American Oil Co. royalties. . . . ¶Dr. Luis Buenahora, former Colombian state governor, made new Colombian oil minister. . . .

PRODUCTION—Bureau of Mines set August crude demand at 4,774,000 bbl. daily. . . . Estimates daily demand at 4,837,000 bbl. for third quarter, 4,717,000 bbl. for fourth quarter, 4,720,000 bbl. for the entire year. . . . August forecast is 26,000 bbl. daily over that for July. . . . ¶U. S. crude production during week ended August 10 drops 68,280 bbl. to 4,823,720 bbl. daily. . . . Texas down 76,450 bbl. daily. . . . Mississippi output highest since October 1942, with daily total of 68,600 bbl. . . . ¶Texas Railroad Commission orders 2-day shutdown for Wasson field, heretofore exempt, because of lack of transportation facilities. . . .

On the basis of development work this year, Abqaiq field, in Arabian American Oil Co.'s Saudi Arabian concession west of the Persian Gulf Island of Bahrein, is ranked as one of the world's greatest oil reservoirs. At left, laid across the sand, is the company's 14-in. pipe line linking Abqaiq with Dhahran field, 45 miles to the northeast. At Dhahran, crude can be directed either to the Ras Tanura refinery or by underwater pipe line to Bahrein Island. The aerial view at right shows part of the Abqaiq producing area. Wells are spaced 2 miles apart with communication by radio telephone rather than land wires because of the shifting desert sands. Nearly 23,000 acres at Abqaiq have been found productive but the field's limits have not been completely established. On the basis of drilling thus far, recoverable reserves at Abqaiq are estimated as high as 2,500,000,000 bbl.

FTC Refuses Reconsideration of Indiana Standard Order

WASHINGTON.—The Federal Trade Commission has modified its order against Standard Oil Co. (Ind.) on charges of violating the Robinson-Patman act by discriminating in prices for gasoline charged various dealers in the Detroit area.

The amended text appears to make little change in the basic terms of the order but applies more specifically to the charges in the case and clarifies the language somewhat. The amendments were made on motion of the commission's counsel. FTC denied Standard's motion for reconsideration and also denied a motion of the National Council of Independent Petroleum Associations to intervene and submit new evidence.

The company was accused of giving wholesale discounts to four favored customers who sold at retail though arbitrarily classified as jobbers by the company. This was found to be an unfair discrimination against other retailers.

In a lengthy dissenting opinion, Commissioner Lowell B. Mason, who was not a member of FTC when the original decision was rendered, ridiculed the majority action on several counts and declared that commission's interpretation of the Robinson-Patman act is impractical and cannot be carried out. Mason declared that distributors performing a wholesaling function are entitled to the jobber's discount regardless of how they are classified, and suggested that application of the majority doctrine would mean that a refiner would have to base his prices on the uses to which a purchaser put his gasoline, charging one price for the portion he retailed and another for the portion he wholesaled. He also accused the FTC of going beyond the language of the law in attempting to regulate competition in the sale of a single brand of product, pointing out that there was plenty of other gasoline of like grade and quality available to dealers in the Detroit area so that competition was not suppressed by any practices which might have curtailed the distribution of Standard's brand.

Buell F. Jones, general counsel of Standard of Indiana, made the following comment: "The revised order to cease and desist remains subject to most of the objections raised on oral argument before the commission by Standard and the jobbers who participated. Those objections are found to be valid in Commissioner Mason's dissenting opinion which we think is eminently correct and legally sound. It is most difficult to determine just what the order requires, and it has not yet been determined whether Standard's right of appeal will be exercised."

OPA-RFC Disagreement Reported Holding Up Decision on Subsidy Payment

WASHINGTON.—Decision on rates of payment for August production under the stripper-well subsidy was expected momentarily this week by the Office of War Mobilization and Reconversion, which must arbitrate a disagreement between the Office of Price Administration and the Reconstruction Finance Corp.

The new OPA law directs that the subsidy be continued, but does not specify rates or duration and it is understood that OPA suggested a 9 months' continuance at a flat reduction of one-third below June payments for all wells, whereas RFC suggested restricting payments to wells producing less than 5 bbl. per day. Another complication is that formerly the subsidy was for payments above ceiling prices, and now there are no ceiling prices and no set figure upon which to fix the subsidy.

The Office of War Mobilization and Reconversion has both views on the proposed subsidy payment and, according to reports, Ed Hayes was studying the question when Reconversion Director Steelman named Harold Stein deputy director for production, stabilization and war liquidation. Stein has indicated he will need several days to familiarize himself with these matters, after which he will decide, it was said.

Meanwhile, purchasing companies were facing another period of payment and should have a decision before August 20, which is the end of the next 10-day crude-oil payment period set by oil company policy. August 1 to 10 crude payments were made very generally without the subsidy, until exact amount can be determined, after which back payments will be picked up.

Gasoline Tax Evasion Trend Seen by Standard Official

RAPID CITY, S. D.—Problems concerned with the evasion of gasoline taxes were discussed at the annual conference this week of the Northwest Central States Gasoline Tax Administrators.

Frank V. Martinek, tax department, Standard Oil Co. (Ind.), and chairman of the central gasoline tax evasion committee, told members that he looked upon the committee as being in the "middle road," in that their efforts are of benefit both to the petroleum industry and state government. Te told the group that the committee was organized in 1931, at a time when widespread, organized tax evasion had become a major racket. The purpose of the various tax evasion committees is to assist state officers in maintaining uniform compliance with the motor fuel tax laws, he said.

Martinek said the petroleum industry has an enviable record of being free from black marketeers. "The first postwar year sees trends developing in some localities that indicate a possible increase of tax evasion," he said. "However, it is such meetings as this and coordinated effort by the petroleum industry and its administrators that will stop this tendency dead in its tracks."

OPA Suspends Control From Tank-Truck Cargoes

WASHINGTON. — Charges for the transportation of liquid commodities, except milk, in tank trucks by contract motor carriers were suspended from price control this week by the Office of Price Administration. The action was effective August 13.

Liquid commodities covered by the action are primarily various petroleum products, such as gasoline and fuel oil. OPA said it believes competition will hold rates charged by contract motor carriers for the transportation of liquid commodities at or near the levels which now exist.

Indiana Standard Gets Loan

CHICAGO.—Standard Oil Co. (Ind.) has arranged with 12 banks throughout the country for a credit of $50,000,000 to aid in financing a major construction program, Robert E. Wilson, chairman of the board, and A. W. Peake, president, announced this week.

U. S., Britain Reported Planning Talks On Multilateral Oil Agreement

NEW YORK.—Before next December officials from U. S. State Department and British Government are planning to meet and discuss negotiations for a multilateral petroleum agreement, according to information current here.

Such plans reportedly will not be altered regardless of whether the Senate Foreign Relations Committee eventually opens hearings on Anglo-American Oil Treaty signed last September in London. In fact, this new development seems to indicate that both the United States and British see little hope for Senate ratification of projected treaty because of fact that it is not "international enough in character," it was said. In other words, both U. S. and British Government officials see need for broadening any international oil treaty to embrace as members all interested producing and consuming countries—one of the ultimate aims of the Anglo-American treaty, but an aim which might not be realized as quickly as some new world agreement.

Moreover, it is pointed out here that "some ill feeling" is more than likely to develop, particularly from Russian sources, if the projected treaty were signed, but that an overall agreement which embraces all interested countries from the start would have better chance of attaining world-wide cooperation on international oil problems. Meanwhile, reports persist that the United Nations Organization is considering an international conference on world oil problems with studies on reserves and conservation practices to be highlighted.

California Standard Plans Interest in Jersey Plant

NEW YORK.—Standard Oil Co. of California this week announced plans to acquire an interest in the Barber Asphalt Co.'s refinery and marine terminal near Perth Amboy, N. J. Pending approval of Barber's stockholders, a new corporation, California Refining Co., has been formed to operate the terminal and other facilities. California Standard and Barber are stockholders.

Officers of the new California Refining Co.'s board of directors include T. Rieber, chairman, who is president of Barber Asphalt; R. G. Follis, vice chairman; and Fred Powell, president.

The New Jersey refinery has a capacity of 15,000 bbl. daily, and will process gulf crudes for California Oil Co., a Standard of California subsidiary now marketing petroleum products on the eastern seaboard.

Barber Asphalt's board of directors recently voted to dispose of the company's Venezuelan oil royalties to Shell Petroleum Co., Ltd., for $25,000,000. The Venezuelan oil had been processed at the Jersey refinery.

Texas Panhandle Production Sold; Bank Loan Announced

A $10,950,000 bank loan and the purchase of producing properties in the Panhandle section featured Texas oil transactions last week.

A loan of $10,950,000 was made in Dallas by the Republic National Bank of Dallas and participating banks to Roger Lacy, Longview, Tex., operator. Part of the loan will be used in meeting current obligations, Lacy said, while the rest will be used in further development of properties in eight Texas counties.

In Amarillo, the entire stock issue of Danube Oil Corp., which holds 640 acres and 31 producing wells in Hutchinson County, Texas, was sold to Income Shares Corp. and Oklan Royalty Corp., both of Tulsa.

Jacobsen Heads New A.P.I. National Oil Policy Group

NEW YORK.—With A. Jacobsen, president of Amerada Petroleum Corp., as chairman of the American Petroleum Institute's new national oil policy committee, plans are already under way to discuss various oil problems which various segments of the oil industry have in common.

During the war, Jacobsen served as chairman of the Petroleum Industry War Council's national oil policy committee, and played a major role in formulating the proposed Anglo-American Oil Treaty.

The A.P.I. oil policy committee is to "discuss problems of national import to the industry, and from time to time submit its findings and recommendations to the board of directors," according to A.P.I. President William R. Boyd, Jr. Committee members are: K. S. Adams, Phillips Petroleum Co.; Robert H. Colley, Atlantic Refining Co.; H. D. Collier, Standard Oil Co. of California; Henry M. Dawes, Pure Oil Co.; O. D. Donnell, Ohio Oil Co.; J. Frank Drake, Gulf Oil Corp.; W. H. Ferguson, Continental Oil Co.; Walter S. Hallanan, Plymouth Oil Co.; B. A. Hardey, Independent Petroleum Association of America; George A. Hill, Jr., Houston Oil Co. of Texas; Eugene Holman, Standard Oil Co. (N. J.); W. F. Humphrey, Tide Water Associated Oil Co.; B. Brewster Jennings, Socony-Vacuum Oil Co.; W. Alton Jones, Cities Service Co.

John M. Lovejoy, Seaboard Oil Co. of Delaware; A. C. Mattei, Honolulu Oil Corp; J. Howard Pew, Sun Oil Co.; Frank M. Porter, Mid-Continent Oil and Gas Association; W. S. S. Rodgers, The Texas Co.; Charles F. Roeser, Roeser & Pendleton, Inc., Fort Worth; Reese H. Taylor, Union Oil Co. of California; H. L. Thatcher, National Council of Independent Petroleum Associations, Chattanooga, Tenn.; Albert E. Watts, Sinclair Oil Corp.; H. C. Wiess, Humble Oil & Refining Co.; Robert E. Wilson, Standard Oil Co. (Ind.); and Ralph T. Zook, Sloan & Zook Co., Bradford, Pa.

New Mexico Operators Plan Corrosion Study

HOBBS, N. M.—Preliminary plans for an intensive corrosion study in Southeastern New Mexico were discussed here at a recent meeting of the corrosion subcommittee of the Lea County Operators Committee.

The committee, formed in April, will study causes and methods for prevention and control of all types of corrosion of oil-field equipment. Its members represent the parent committee, the New Mexico Bureau of Mines and Mineral Resources, the New Mexico Oil Conservation Commission, and New Mexico School of Mines.

N. Raymond Lamb, engineer with the state Bureau of Mines and Mineral Resources heads the new corrosion subcommittee. Other members are: George H. Gray, Repollo Oil Co.; Frank Gray, Anderson-Prichard Oil Corp.; W. R. Bollinger, Shell Oil Co., Inc.; R. R. Spurrier, New Mexico Oil Conservation Commission; and G. H. Hirschfield, Lea County Operators Committee.

Wasson Shutdown Ordered

AUSTIN, Tex.—An amendment to the recent general shut-down order by the Texas Railroad Commission, wherein the Wasson field of District 8 (West Texas) was exempted from shut-down days, provides for two nonproducing days during August, giving the field a total of 29 producing days.

The commission said that subsequent to the issuance of the original order, additional evidence had been submitted showing limited pipe-line capacity.

International

WORLD-WIDE OIL DEVELOPMENTS

Mexican Ministry Asserts Oil Policy Unchanged by Sinaloa Offer

by Curtis Vinson

MEXICO CITY.—In offering to treat by contract with private interests for oil development in the state of Sinaloa, the Mexican Ministry of National Economy is in nowise departing from Mexico's established oil policy, the ministry explained in a formal announcement published in the Mexico City press recently.

Furthermore, it was made plain, without specifically using the word "foreign," that foreign capital is not included in the invitation to explore and exploit for petroleum the 30,000 hectares near San Ignacio designated as available for private development.

The ministry's statement, made in the wake of official publication of the notice inviting bids for contracts, came in answer to a somewhat widespread demand, international in scope, for definite clarification of just what the offer means in relation to Mexico's oil policy of the last 8 years, and just who can and who can't bid on the Sinaloa acreage.

The ministry's formal explanatory statement, as it appeared in the newspaper Excelsior, set forth that the invitation to private interests to operate in Sinaloa has no implication whatever of any change in the oil policy being followed by the federal Government. On the contrary, it was added, the offer is in keeping and in compliance with the nation's petroleum law.

The statement further set forth: (1) That the offer was made in conformity with Article 6, Paragraph 3, of the Petroleum Law, and in keeping with the regulations laid down in Article 23 of the rules of the law. (2) That before publication of the notice, the ministry had complied with Article 18 of the Petroleum Law providing that public oil institutions or administrations (such as Petroleos Mexicanos) shall have preferential rights to any lands being considered for development by the Government. In this connection, it was added that PM, the Government oil administration, had given indication it was not interested in the lands in Sinaloa in question. (3) That, in accordance with the provisions of Article 10 of the Petroleum Law, any contract which might come as the result of the offer, could only be as follows:

1. With private Mexicans, that is, Mexican individuals.
2. With societies or corporations made up wholly of Mexicans.
3. With a mixed corporation in which the federal Government would hold the majority of capital.
4. Under no circumstances could a contract be entered into with a corporation issuing bearer shares.

This statement has definitely dimmed, not to say dissipated, the somewhat hopeful expectancy with which various foreign independents, still holding on in Mexico, viewed the Sinaloa offer, to say nothing of the interest it doubtlessly generated for the time being in major foreign oil circles.

Importance of Offer

What response the offer elicits from such private interests as would be permitted under the regulations to bid — that is, Mexican interests— should prove something of a yardstick for measuring the extent that private Mexican capital may be expected to go in oil development in Mexico's modern industrialization campaign. That is, this should be the case, provided the San Ignacio acreage comes to have an appeal for the oil explorer. In the absence of geological reports on the area, the prospect may prove unattractive. Production nearest the region is now in the Tampico area and in the Mier gas area south of the Texas border. Both these areas are 500 miles or more from Sinaloa. Other production within approximately the same mileage range is found in the United States in California.

The offer was the first announcement of its sort since March 18, 1938, when the Mexican Government expropriated the large foreign-held oil properties in Mexico, and was made by the Ministry of National Economy. It was first published in the Mexico City newspaper Excelsior July 16, and later in the Diario Oficial, the Government's gazette, which gave it official status.

By the terms of the ministry's announcement, the area in question would be opened to private exploitation on a contract basis over a period of 30 years. The private contractor would get 87.5 per cent of the production, the Government the remaining 12.5 per cent. Applications for exploration and exploitation contracts would be received during a 60-day period beginning August 1. Other terms of the offer were set out in an article in The Oil and Gas Journal's International Section, page 62, issue of August 3.

The area thus offered for private exploitation is in the southern part of Sinaloa state, about 90 miles southeast of Culiacan, capital of the state.

It is recalled that a geological reconnaissance survey was made in Sinaloa back in 1920-21 under the direction of Walter English of Standard Oil Co. of California. Seepages were reported near the town of Sinaloa in the northern part of the state but these, it is understood, were found to be of vegetable rather than mineral origin, and no oil findings were reported. The geological party went on from Sinaloa to the state of Chiapas. Since then, according to geological circles, no study of the Sinaloa region for oil has been made.

The cost of drilling in the area in question is still a matter of speculation, since there appears to be no definite information on the depth to which it would be necessary to go to prove or disprove production. It might cost $100,000 to $150,000 for each test. To this would have to be added the

cost of roads, camps, and, in case oil should be found, transportation facilities for the production. An initial cost, of course, would be geological and geophysical work.

Another point has to do with development provided production should be obtained. In the announcement, it is specified, as mentioned, that when commercial production is obtained, the Ministry of National Economy may incorporate one-half of the productive zone into the nation's oil reserves, and that at that time terms would be agreed on for exploitation of the other one-half retained by the contractor. This would leave exploitation terms until after production had been developed.

There is, in addition, the highly important question of marketing production. With the exception of a short period after expropriation, Pemex has been the only available market for such independents as remained in business in Mexico. It seems logical to assume that this policy would not be changed with the advent of any new private development.

In this connection, it is pointed out that there are yet a few private interests in the oil business in Mexico. Among them is the firm of Muñoz and Martinez, drilling in Northern Tamaulipas in the gas area south of the Texas border. Muñoz and Martinez hold certain so-called confirmatory concessions antedating Mexico's existing oil policy. Some independent operators also still hold properties in the Tampico and Veracruz areas but have no market for their production except Pemex, since exporting on their part is not permitted by the government oil administration. Few new permits to drill have been issued since 1938 to independents.

As for the "private" interests term, there seems little basis in the light of existing legislation by which it may be interpreted to include foreign capital. The existing Mexican petroleum law, with corollary legislation, prohibits to all intents and purposes the participation of foreign capital in oil exploitation in Mexico.

There have been various predictions, however, that with the forthcoming change in the national administration next December, some changes in the handling of the oil industry may be expected. President-elect Miguel Aleman repeatedly emphasized in his campaign a program for greater industrialization in Mexico. In carrying on such a program Mexico's need of petroleum would of necessity grow in a marked way. Whether Aleman will move to meet that need through utilizing foreign capital and know-how is a question of great and vital interest here.

Russian-Swiss Company Is Organized To Market Romanian Oil

NEW YORK.—The disclosure of a joint Russian-Swiss oil combine, whereby Romanian oil would be marketed in Switzerland, came as a distinct surprise to oil men here who stated that they did not yet have sufficient information to determine what the long-range effect may be on Allied-owned oil in Romania, which the Russians still indirectly control.

However, oil circles in the United States said that this might be some type of temporary arrangement—as far as the Swiss interests are concerned—to meet increased demands which have resulted from postwar tourist trade. It is obvious, these sources add, that this move on Russia's part is another step to entrench herself in widespread European oil activities and to make it all the more difficult for the Allies to regain their prewar status.

The Russians reportedly hold 40 per cent of the joint company's interests, with the remaining 60 per cent held, presumably, by private Swiss capital. Disclosure of this company's activities was premature, in so far as the Russians were concerned, as it had been hoped that the secret would not leak out until after the Paris Peace Conference.

Robert Eakins, assistant chief of State Department's Petroleum Division, is now en route to Switzerland to study this corporate set-up.

Romanian inflation and Russian direction of oil—after it leaves refineries which the Russians are "allowing" Allied interests to operate—continue, with the usual delays over payment of the oil and useless complaints over specifications, after the oil has been delivered, to be thorn in the side of United States and British oil operators.

Standard Oil Co. (N. J.) and the Socony-Vacuum Oil Co., Inc., hold most of the Americans' prewar 12 per cent of Romania's production and 16 per cent of the refining capacity. Current production is estimated to be 85,000 bbl. daily. The exact extent to which war-damaged plants have been repaired is not known here.

Switzerland's current daily consumption of all petroleum products has been estimated at 11,300 bbl., compared with 10,300 bbl. in 1938. The estimated demand for 1950 is 16,400 bbl. Following are estimated figures broken down into the various petroleum products for before and after the war (all figures are in barrels and show total annual consumption):

	1938	1946
Aviation gasoline	36,000	146,000
Motor gasoline	1,825,000	1,515,000
Kerosene	156,000	80,000
Distillate	1,379,000	1,865,000
Residual	.....	275,000
Total	3,396,000	3,881,000

Meanwhile, the Russian practice of seizing Allied-owned Austrian oil has been severely criticized by Fiorello H. La Guardia, director general of the United Nations Relief and Rehabilitation Administration. La Guardia pointed out recently in Geneva, that he saw no reason to "hush-hush" the Russian deal to sell 15,000 tons (105,000 bbl.) of crude to Czechoslovakia, in face of the Russian refusal to meet UNRRA's fuel demands for the purpose of distributing food in Austria. He added that the Russian attitude "should be reconciled by an appropriate international authority."

International

Loan to Saudi Arabia Secured by Royalties

WASHINGTON.—Repayment of the recent $10,000,000 loan made by the Export-Import Bank to Saudi Arabia will be secured by an assignment of royalties due from the Arabian American Oil Co., Herbert E. Gaston, vice chairman of the board of directors of the bank announced last week.

The credit, to be used to purchase essential supplies and rehabilitation equipment in the United States, will extend over a 10-year repayment period.

Dr. Luis Buenahora New Colombian Oil Minister

BOGOTA, Colombia.—Dr. Luis Buenahora, former governor of North Santander, became Colombia's new minister of mines and petroleum last week when the new cabinet took office with the inauguration of President Mariano Ospina-Perez. Dr. Buenahora has also been a congressman and a House oil-committee member.

Venezuelan Test Promising

CARACAS. — Colon Development Co., Ltd.'s 2 West Tarra, at Los Cerritos, in Venezuela, showed production of 2,100 bbl. daily of 47.5° (A.P.I.) crude on a short drill-stem test from an interval of 6,820 ft. to 6,855 ft. This well is on a structure about 10 km. west of the Tara anticline.

Oil in United States' Foreign Policy

by John A. Loftus

What is the United States foreign policy? This question has been a frequent subject of speculation both within and without the industry.

This abridged address by John A. Loftus, chief of the petroleum division of the Department of State, delivered recently at the University of Pittsburgh, gives an indication of official views on the subject.

Loftus entered the department in November 1943 as divisional assistant in the division of economic studies. In April 1944 he was appointed recording secretary of the United States group of experts in the preliminary and explanatory discussions of petroleum questions held with the United Kingdom in Washington. He served as a member of the U. S. delegation during the United States - United Kingdom conversations on petroleum in Washington in July and August 1944 and in London in September 1945.

Loftus was born in Brooklyn, New York, August 2, 1911. He was graduated from Catholic University in 1936 and Johns Hopkins (Ph.D.) in 1940. He was associate professor of economics at Holy Cross College, 1940-42, and associate in economics at Johns Hopkins in 1942. He served as economic and price specialist, Office of Price Administration, in 1942-43 and as economic adviser in the Board of Economic Warfare in 1943.

AS of today what is the foreign oil policy of the United States? As I see it there are three aspects to foreign oil policy. In the first place, there is the specific application to oil of our general commercial policy. In the second place, there is what might be called our "National" oil policy—the things with reference to oil what we want to accomplish in our own strict national interest. Finally, there is what might be called "international" oil policy.

We shall continue to press for the same objectives — nondiscrimination, equality of opportunity, fair treatment. Beyond this, however, we also assume that oil will find its place in that pattern of expanding and liberalized international trade which the U. S. Government seeks to attain by intergovernmental consultation and collaboration. Such a pattern of world trade is the end-object of the United States "Proposals for the Expansion of World Trade and Employment." The mechanisms of collaborative action which we hope the nations of the world will undertake are described in those proposals. They include the elimination or reduction of restrictions upon trade imposed by governments, such as tariffs, preferences, quotas, miscellaneous import and export prohibitions or restrictions, export subsidies, discriminatory exchange controls, and discriminatory treatment on the part of the state trading enterprises. They include also the elimination of restrictions imposed by private combines and cartels, such as combinations or agreements to fix prices and terms of sale, divide markets or territories, limit production or exports, suppress technology or invention, exclude enterprises from particular fields or boycott or discriminate against particular firms. they also include the elimination or mitigation of that disorder in the markets for certain primary commodities which results from the existence of burdensome surpluses accompanied by widespread distress to many small producers; this object is to be effected by the negotiation, where appropriate, of intergovernmental commodity agreements designed to prevent or alleviate economic dislocations and so remedy, if possible, their root causes. Finally, our program calls for the elimination of those violent fluctuations in economic activity and prosperity which result from the inability of nations to maintain high and stable levels of employment and production. If these collaborative measures are firmly and boldly espoused, the pattern of world trade in oil will perhaps be modified somewhat, but its volume will be increased and its contribution to the prosperity of nations and to a general increase in levels of living will be enhanced.

Such, in too brief a summary, is our commercial policy in its application to oil. What is our "national" oil policy? A policy is, I think, essentially a coherent answer to these three question: (1) What is the situation that confronts us? (2) What are the objectives that we must attain? (3) What are the main lines of action by which they can be attained?

Toward an Oil Deficit

The situation that confronts us is one wherein foreign oil supplies assume an unprecedented importance. It is almost a new experience for the United States to have to worry about the oil that might be needed in peace or war for essential requirements of the nation. Except for a short period in the early twenties the oil economy of the United States was one of abundance, indeed of surplus. There are serious indications that such is no longer the case and we cannot in good conscience close our eyes to these signs.

I do not rashly draw gloomy conclusions. I do not say that we cannot bring in another East Texas. I do not say that we shall necessarily have a deficit of 3,000,000 bbl. per day by 1965. I do say that, on the basis of presently known facts, there is serious indication that if consumption increases at the rate foreseen by the best petroleum economists and if the discovery rate that characterized the last 7 years is not greatly surpassed, then within a few years we shall of necessity be as a nation a significant net importer of petroleum. Either or both of these if's may be invalidated by future events —but there is no present evidence affirmatively suggesting that they will be. The only conclusion which I draw is that we are obligated in prudence to consider the possibility of substantial dependence upon external sources of supply and therefore to consider the measures which we should take to ensure the availability of foreign supplies.

Our Oil Objectives Abroad

The measures which we should take would be directed toward the following ends:

1. To promote the development of these sources of supply (primarily in the Western Hemisphere) which are well located from our point of view—that is, economically located under circumstances of peace and strategically located under circumstances of war.

2. To encourage and facilitate withing reason the participation

of American capital and enterprise in the development of such sources of supply — not merely because of the readier access which such participation would guarantee to us but also because on the record the technical and managerial skill of the American petroleum industry is preeminently competent to ensure the prompt and efficient development of resources anywhere.

3. To promote the development of oil potentialities in the Eastern Hemisphere, particularly in the oil-rich areas of the Middle East—so that the expanding requirements of Europe and Asia for petroleum products can be met from Eastern Hemisphere production without that drain upon Western Hemisphere reserves which has characterized the pattern of world oil trade in the past.

4. To facilitate and encourage within reason the participation of American capital and enterprise in the development of Eastern Hemisphere resources.

These are the main objectives which from the point of view of our own national wellbeing we should seek to attain. The mechanisms by which we can further their attainment are too numerous to list in detail but include such things as:

1. Promotion of a generally stable political and economic environment.

2. Encouraging the emergence of sound conditions of basic law and of contract so that oil industry operations abroad can be conducted in an atmosphere of reasonable political tranquillity.

3. Promotion worldwide of conditions of expanding trade upon liberal principles and in stable convertible currencies so that an adequate commercial incentive will be provided for the development of known oil potentialities.

4. Promotion of free and flexible competition in the international oil trade so that supplies from abroad may be available to meet the needs of the United States and to supplement our indigeous productive capacity.

5. Promotion of fair and mutually beneficial contractural relations between American oil companies and the governments of those countries whose oil resources are being developed so that (a) the investment position of American companies will be solidly based; (b) it will promote good intergovernmental relations; and (c) the commercial operations of American companies are conducted always in such manner as to foster the economic advancement and to raise the standard of living of the people within whose territory the oil is found.

6. Elimination of political and commercial restrictions upon the free competitive development of oil resources wherever found. This, as you know, was one of the principal objectives sought in the negotiation of the Anglo-American Petroleum Agreement.

The foregoing is, I think, the outline of a sound foreign oil policy and program for the United States. Lest it be misunderstood, I hasten to add that it is not a program for forcing imports, or for undermining the American domestic petroleum industry, or for flooding the country with cheap oil. It is a policy and program designed to ensure that, if this country finds that it needs to import

substantial quantities of oil to maintain its complex industrial economy and to ensure its military security, the circumstances of world trade in oil will be such as to guarantee the availability to the United States of whatever petroleum supplies the domestic industry may be incapable of producing.

Basis of an International Oil Policy

Finally, we turn to the question of what I earlier called "international" oil policy. The situation that confronts us can be described in the following terms:

In the first place, petroleum is a commodity of tremendous strategic and military, as well as commercial, importance, and it is therefore an object of acquisitive competition among nations. This needs no elaboration. In the second place, the irregular geographic distribution of petroleum reserves bears no relation to political boundaries or to the geographic distribution of the world's population. In the third place, oil reserves through sheer accident apparently occur in rough inverse correlation to the present occurrence of industrially advanced areas.

The foregoing are physical characteristics of the occurence of oil. Certain other aspects of oil development which derive from the foregoing are less immutable.

For instance, control of underground oil resources, outside the continental United States and the Soviet Union, tends to be vested in

The map emphasizes the fact that much of the world's oil production is remote from the more heavily populated and industrialized areas. Principal oil production is in the southwestern United States, Venezuela, and the Middle East. In contrast, more than 87 per cent of the world's oil is consumed in North America, principally the United States, and Europe

a relatively small number of very large corporate organizations. Not more than a dozen companies in all control the bulk of production and marketing of that oil which moves in international commerce. Indeed, for practical purposes, seven companies exercise this control. Pairings and groupings of these seven conduct joint operations in many parts of the world. For instance, four of them control over 70 per cent of the shares of Iraq Petroleum Co., which in turn controls all the oil of Iraq, Qatar, the Trucial Coast, and other less important areas of the former Ottoman Empire; two of them control all the known oil of Saudi Arabia; one controls exclusively the presently developed oil production of Iran, and (in equal partnership with another of the seven companies) controls all the oil of Kuwait; five of them, organized into three corporate entities, control almost all the oil of the Dutch East Indies and do most of the petroleum marketing in the Far East; one holds title to all the developed resources of Hungary; their combined direct and indirect interest in the oil industry of Rumania accounts for almost 50 per cent of the total; separately and in various combinations they control most of the oil in Latin America, except in those countries which have nationalized their resources.

This kind of concentrated control arose logically and naturally as a consequence of the geographic location of oil resources. When in fact the most promising oil regions coincided with areas of industrial underdevelopment, and indeed in some cases of political backwardness — areas the inhabitants of which lacked both the elaborate technical competence and the large quantities of capital required for the development of oil resources—it was to be expected that such development, which had to be undertaken by enterprises not native to the areas in question, would be undertaken only by organizations possessing large amounts of capital and qualified to assume large risks.

The result of these circumstances was that the great oil companies of the world in devising the arrangements under which they would operate in foreign countries have logically sought maximum latitude in their rights to operate and in their chances of gain, and simultaneously sought to ensure minimum political interference with their activities. This they have sought through the negotiation of concession contracts. A concession contract is, in the last analysis, a comprehensive set of rights, privileges, and immunities on the one hand, and financial and other obligations on the other hand.

The successful negotiation of such contracts as these resulted in situations where the oil companies have enjoyed, or have had an opportunity to enjoy, tremendous grants of economic power and far-reaching rights of self-determination. In cases too numerous to mention the result has been uneasiness, suspicion, and distrust on the part of the grantor and in the more extreme instances this has led to cancellation or expropriation. It promotes conditions under which the temptation always exists for some other power to play upon the uneasiness and suspicion latent in the minds of the granting government and thus establish an opportunity to acquire valuable developed oil rights.

This kind of an over-all situation is not conducive either to peace or to commercial stability.

What objective should be sought if peace and stability are to be ensured? Principally these:

1. To bring about circumstances whereunder, because of diminished political risks, small as well as large units can engage in the development of foreign oil resources.

2. To create conditions whereunder suspicion and uneasiness are allayed because there is some assurance that the contractural relations are fair, just and beneficial to both parties.

3. To promote conditions providing assurance that unnecessary powers are not vested in private oil companies.

4. To assure that all nations will enjoy access on competitive and nondiscriminatory terms to the petroleum resources of the world.

It is as yet too early in the process of moving toward a more orderly and stable organization of the world oil industry for anyone to profess to know how these objectives can best be accomplished.

A Promising Development

One promising development taking place is a movement away from the granting of large concessionary rights through bilateral bargaining and in the direction of establishing a uniform and general basis of law governing the acquisition and exercise of rights with respect to oil resources.

Also there is a disposition, in the negotiation of concession contracts and in the formulation of basic laws, to include provisions designed clearly and frankly to recognize the legitimate interest of sovereign governments in the rate at which and the manner in which their oil resources are to be developed and to offer safeguards against two eventualities that governments tend to fear, namely, bottling up of their resources by private companies and an excessive rate of extraction.

Also there is a disposition to welcome the financial and technical participation of foreign nationals or governments in the processes of the oil industry. Consequently new arrangements are being devised and new ways of organizing oil ventures are being worked out, the object of which is to permit genuine cooperative undertakings with management control continuing to reside in the element that is technically the more competent and that assumes the larger risks.

Also there is a disposition to recognize that oil development in foreign countries is not and cannot be something conducted with a view to pecuniary profit alone, but must also be consciously directed toward the economic betterment of the peoples within whose territory oil is found, by the provision of fair revenues, by cooperative planning of public improvements, and by the provision of abundant supplies of local fuel at reasonable prices.

Finally, there is a growing pressure for the negotiation of some kind of world oil agreement which would result in the establishment of an international body under the United Nations organization. Only time will tell the full scope and efficiency of such international undertaking as may ultimately emerge.

The Governments of the United States and the United Kingdom, when they negotiated their bilateral agreement on petroleum, undertook to seek early multilateral agreement among nations and to promote the convocation at an early date of a world oil conference looking toward the negotiation of such an agreement and the establishment of an international consultative body. The early realization of this objective not only will be of incalculable benefit to the preservation of cordial relations among nations with respect to a potentially explosive commodity of tremendous industrial and military significance; it will be of comparable benefit to the commercial prosperity and stability of oil industry operations.

Haiti Gasoline Imports Up

WASHINGTON. — Haiti imported 29,432 bbl. of gasoline from October 1945, through March 1946—4,256 bbl. more than in the corresponding period in 1944-45, according to the Foreign Commerce Weekly.

Shale Oil Output Forecast

LONDON.—Estonia's shale oil industry is expected to be producing around 150,000 tons (1,050,000 bbl.) by 1950, according to a Russian radio report which attributed this statement to the Estonian minister for the shale oil industry.

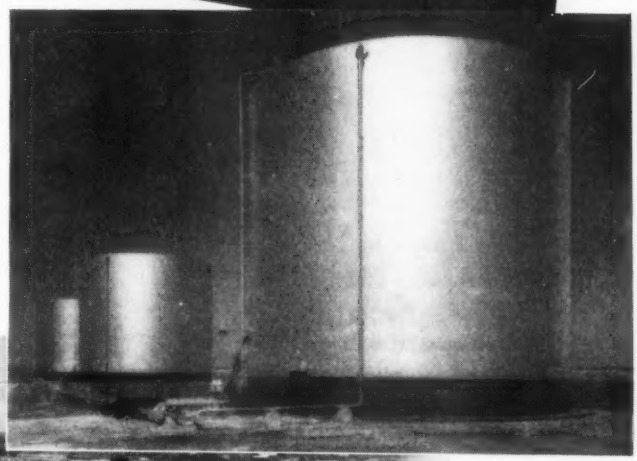
Cycling Plant

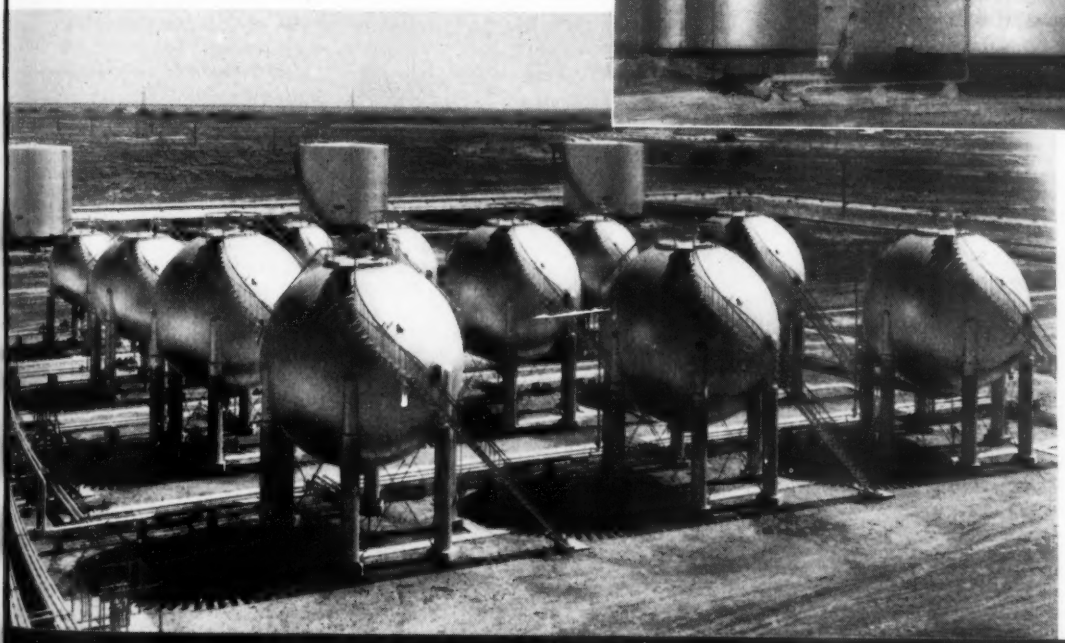
USES HORTONSPHERES AND HORTON FLAT BOTTOM STORAGE TANKS FOR MORE EFFICIENT OPERATION

In cycling operations where wet gas from gas or oil wells is put through an absorption plant to recover propane, normal butane, isobutane, natural gasoline and other liquid petroleum products — adequate and dependable storage facilities are essential to efficient operation. Some of the products recovered may be stored in flat bottom tanks while other products require pressure storage such as Hortonspheres. Storage facilities at the South Coles Levee Cycling Plant near Bannister, California, include both types of tanks.

Hortonspheres are used to store volatile products that require pressure from 10 to 200 lbs. per sq. in. They protect their contents from evaporation loss and the hazards of fire. Their maintenance costs are low and they are dependable. They are built in a wide range of sizes as shown in the table at the left.

When you require storage facilities for any kind of petroleum products write our nearest office for quotations on *Horton* tanks.





BRIDGE & IRON COMPANY

Chicago, 4	2128 McCormick Building
New York, 6	3347-165 Broadway Building
Cleveland, 15	2204 Guildhall Building
Los Angeles, 14	1423 Wm. Fox Building
Atlanta, 3	2154 Healey Building
Birmingham, 1	1536 North 50th Street
Tulsa, 3	1606 Hunt Building
Houston, 1	5619 Clinton Drive
Philadelphia, 3	1615-1700 Walnut Street Building
Washington, 4	703 Atlantic Building
San Francisco, 11	1254-22 Battery Street Building
Detroit, 26	1514 Lafayette Building

WASHINGTON WATCHING

BY HENRY D. RALPH

The Price Board's Task

WASHINGTON.—All eyes this week are on the new Price Decontrol Board which, by the evening of August 20, must make four vital decisions which will give a clue to whether major portions of our economy will be subject to further government regulation or to the workings of a free market.

Unless the board takes positive action, the Office of Price Administration will, on August 21, reimpose its price controls on four groups of commodities — livestock, grains, dairy products, and cottonseed and soybeans. At streamlined hearings this week the affected industries and various government agencies have been submitting briefs and arguments for and against recontrol. The decisions are awaited by all industries because of the precedents they will set for the board's future actions.

Immediately after August 21 the board will have before it the question of recontrolling three other groups of commodities—petroleum, tobacco, and poultry and eggs. However, there is no indication that the board will move rapidly with these cases.

Under the price-control extension bill as finally passed by Congress, the first four groups of commodities are considered guilty until proved innocent; that is, they go back under control unless the board gives them a stay of execution before August 21. The other three groups, including petroleum, are considered innocent until such time in the future as the board may find them guilty and recommit them to the custody of OPA.

OPA itself seems to be quite satisfied that it is out from under the oil control headache, and none of its officials has complained that the recent price advances have been unreasonably high or inflationary. On the theory that "a watched pot never boils" OPA will retain a nucleus staff in its former petroleum section to keep a check on oil price movements.

The industry can be pretty well assured that unless there is another big advance in oil prices neither the OPA nor the Decontrol Board will make any move to put back price controls on petroleum and its products.

Incidentally, the Price Decontrol Board has been criticized for recruiting its staff from the OPA, the inference being that these men will carry over their alleged fetish for strict government regulation of everything and will indoctrinate the board. This probably is a false fear. The three board members seem to be men of sound and independent judgment, not likely to let subordinates lead them around by the nose. Their staff will number not more than a dozen or so, at least for the present. Their first need was for speed in acting on the four "guilty" commodities by August 20, so they had to recruit assistants from other government agencies and it was quite logical to take men familiar with OPA history and procedure on which the board must pass judgment.

Unless and until otherwise demonstrated, the Price Decontrol Board should be viewed as an entirely independent and judicious body.

Additions to OGD's Staff

THE Oil and Gas Division of the Interior Department is moving slowly in building up a staff, but has just added two petroleum specialists, Leo F. Connell and Carroll D. Fentress.

The search is still on for a director and associate director, and until men of the desired caliber, experience, and standing in the industry can be induced to accept the posts it is probable that little will be done in the way of formulating new policies. In the meantime the small staff transferred from the old Petroleum Conservation Division and the few holdovers from the Petroleum Administration for War are working mainly on organization and budget problems, outlining the scope of their future activities, and studying the petroleum activities of other federal agencies with a view to locating duplications and conflicts that may need to be smoothed out.

Connell is a petroleum engineer who served as special consultant on petroleum matters to the foreign liquidation commissioner for 8 months before his transfer to the Oil and Gas Division. During the war, he was with Petroleum Administration for War, serving for 3½ years as assistant director of construction and assistant director of materials. He was associated with the Sun Oil Co. at Philadelphia for 13 years before entering government service with the Petroleum Administration for War.

Fentress comes to the division from the Army, which he entered in March 1942 as a first lieutenant and which he left last April as a major. Since February 1944 he had been assigned to duty with the Petroleum Administration for War. As field representative and chief of the process section of the refining division, PAW, he was responsible for the construction, modification, operation, and finally for the orderly shutdown of 25 government-owned, privately operated aviation gasoline facilities. He was employed in the research department of the Standard Oil Co. (Ind.) for 7 years before entering the Army.

More Legal Sparring

No developments in the "Mother Hubbard" antitrust suit against the A.P.I. and major oil companies are expected until mid-fall at least. The court has given the Justice Department until October 15 to answer, or file objections to answering, the long list of interregatories submitted by Sun Oil Co. demanding specific charges of when and where and how Sun committed the various alleged illegal acts described in general terms in the original suit.

Most of the other defendants also filed motions for bills of particulars requiring similar specific details as to them, but the rest of the motions contain technical defects—apparently done deliberately—so that under the court's rules of procedure the department does not have to take any action with respect to them, at least until the defects are corrected or the court makes a ruling.

About the only conclusion that can be drawn from this situation is that neither the defendants nor the Government is in much of a hurry to go to trial on the 6-year-old case.

Fresh Air for the FTC

THE moribund old Federal Trade Commission is being shaken to its petrified roots these days by the fresh thinking and slangy language of its newst commissioner, Lowell Mason.

A couple of months ago Mason startled the legal world with a dissenting opinion in a beer-labeling case in which he said he couldn't see that the public was deceived or defrauded by use of the word "Canadian" on a beer label which also said the beer was made in the U.S.A. The startling part was not his view but the way in which he expressed it. He started out by criticizing the com-

mission for using involved legal langauge and said since the FTC was a sort of businessman's court it should use language that the ordinary business man could understand. He then proceeded, in the language of the street, to bawl out his colleagues for splitting legal hairs instead of taking practical viewpoints regarding charges that certain business practices deceive consumers or are unfair to competitors.

Now Mason has scored again in his dissent from the majority decision regarding gasoline - jobber discounts allowed by Standard of Indiana in the Detroit area. The dissent is pretty long and reads like a couple of ordinary Joes discussing the matter over a beer, but the gist of it is that the other four commissioners are attempting to regulate business by reading lawbooks instead of looking at the practical workings of the market.

Mason's parting shot could be taken as a dig at certain other regulatory agenies attempting to control various form of business activity:

"In my opinion, the commission in this case has dealt with the facts and the law just as Procrustes dealt with the unfortunate guests who slept in his bed. The commission has cut off the facts of the case that do not fit in with the order, and it has stretched out the statute until it is no longer the law Congress passed but becomes the law that the commission would like to enforce. It requires private policing one man's business by another. It freezes the avenues of trade to set patterns. It eliminates the profit for one type of distributor and guarantees the profit to another. It subjects branded goods to restrictions not applied to unbranded goods. It attempts to settle a private struggle between enterprisers by opening a Pandora's box of governmental directives on a minutia of accounting and distributing practices that bear scant relation to what Congress sought to inhibit.

"I am against it."

Mississippi Board Studies 75-Bbl. Heidelberg Allowable

JACKSON, Miss.— The Mississippi Oil and Gas Board has taken under advisement a petition of Gulf Refining Co. for an allowable take of 75 bbl. per well per day from Heidelberg field, Jasper County,

Testimony on the petition was heard by the board August 7, at which time Gulf sought to show that a higher withdrawal rate decreased the bottom-hole pressures, increased water production and endangered the structure. The board was told that increased withdrawals would possibly result in the trapping off of several million barrels of oil that would be lost to production forever.

East Coast Residual Prices Stabilized at Slightly Lower Level

RESIDUAL fuel oil prices in the New York harbor early this week appeared stabilized at a level 20 cents above that prevailing prior to the July 25 crude oil advance.

Two major East Coast suppliers reported reducing residual prices 5 and 10 cents per barrel, thus cutting back the net increase to 20 cents a barrel. Earlier, Standard Oil Co. of New Jersey boosted residual prices 20 cents per barrel in the face of 25 and 30 cent hikes by other companies.

A flat price of $1.92 per barrel was quoted early this week for tank-car and barge loads of No. 6 in New York harbor. Quotations for tank-wagon deliveries of No. 6 were down to a flat 5.46 cents per gallon in metropolitan New York.

In the Mid-Continent area, gasoline prices were steady at 6¾ cents for regular, though a few sales ⅛ cent under were reported. Some market observers felt this price would hold through the season of heavy demand, which, they believe, this year will continue well into fall. Distillate burning oils are expected to show increasing firmness in the next few weeks.

Natural Gasoline Moved Upward

Mid - Continent natural gasoline moved upward again last week. New price in Oklahoma, 26-70 grade, was 4¼ cents. This represented a recovery of a full cent and a half from the natural-gasoline low last March and was only ½ cent below the former ceiling at which the product sold before it began dropping last winter.

In the East, the first cut in gasoline quotations came when one supplier reduced his prices for unbranded motor fuel by 0.05 cent at New York and Philadelphia and 0.2 cents at Baltimore. His action set new market lows at all three points. His new price for 76 minimum octane leaded was 7.75 cents tank-car and 7.65 cents barge at New York and Philadelphia. Premium was quoted 1 cent higher.

In California, despite occasional sales at fractions of a cent below the general quotations for tank-car gasoline, the refinery market for motor fuel seemed inordinately well supported at higher levels established when crude oil and products advanced.

Continuing shortage of tetraethyl lead was stimulating requirements for natural gasoline and high-octane fractions from cycling plants. Imports of crude oil at California oil terminals are averaging nearly 50,000 bbl. daily, an increase of 50 to 60 per cent from the average prevailing in 1945 but these receipts are hardly more than adequate to offset curtailment in domestic producing operations. Offshore shipments are showing a moderate but steady gain.

A.P.I. Directors' Meeting To Be Held in Washington

NEW YORK.—A meeting of the board of directors of the American Petroleum Institute has been called for September 25 in Washington to consider revisions in the program of the twenty-sixth annual A.P.I. meeting November 11 in Chicago.

William R. Boyd, Jr., A.P.I. president, said the proposed changes in the November meeting program are in line with the institute's policy of broadening the scope of its work and will result in more talks and events of general non-technical interest. The Washington directors' session will be at the Carlton Hotel and precedes by one day the second meeting of the new National Petroleum Council.

Shell Oil Expanding Midland, Tex., Offices

MIDLAND, Tex.—Shell Oil Co., Inc. has increased its office facilities in the Petroleum Building here to what will eventually include eight floors as a part of the general revamping of its southwestern organization.

Houston officials said the lease is effective immediately and the company will take possession of six floors soon. The other floors will be taken over when present tenants move.

DEATHS

Benjamin L. Pilcher, 39, scout for The Texas Co., died August 13 in Albuquerque, N. M., from injuries sustained in an automobile accident near Vaughn, N. M.

Francis Barton Dillard, 85, retired attorney for Oil Well Supply Co., died August 9 in Tulsa. He also had served as general counsel for The Texas Co.

Charles B. Moon, 79, associated with Pennzoil Co., died August 4 in Oil City, Pa.

Farren MacMahon, 51, assistant to the vice president of Sinclair Refining Co., died recently at his home in Chicago.

Raymond D. Lipe, 46, industrial salesman of Carter Oil Co., died August 13 in Bristow, Okla.

Continental Oil Co. STREAMLINES Wichita Falls Refinery

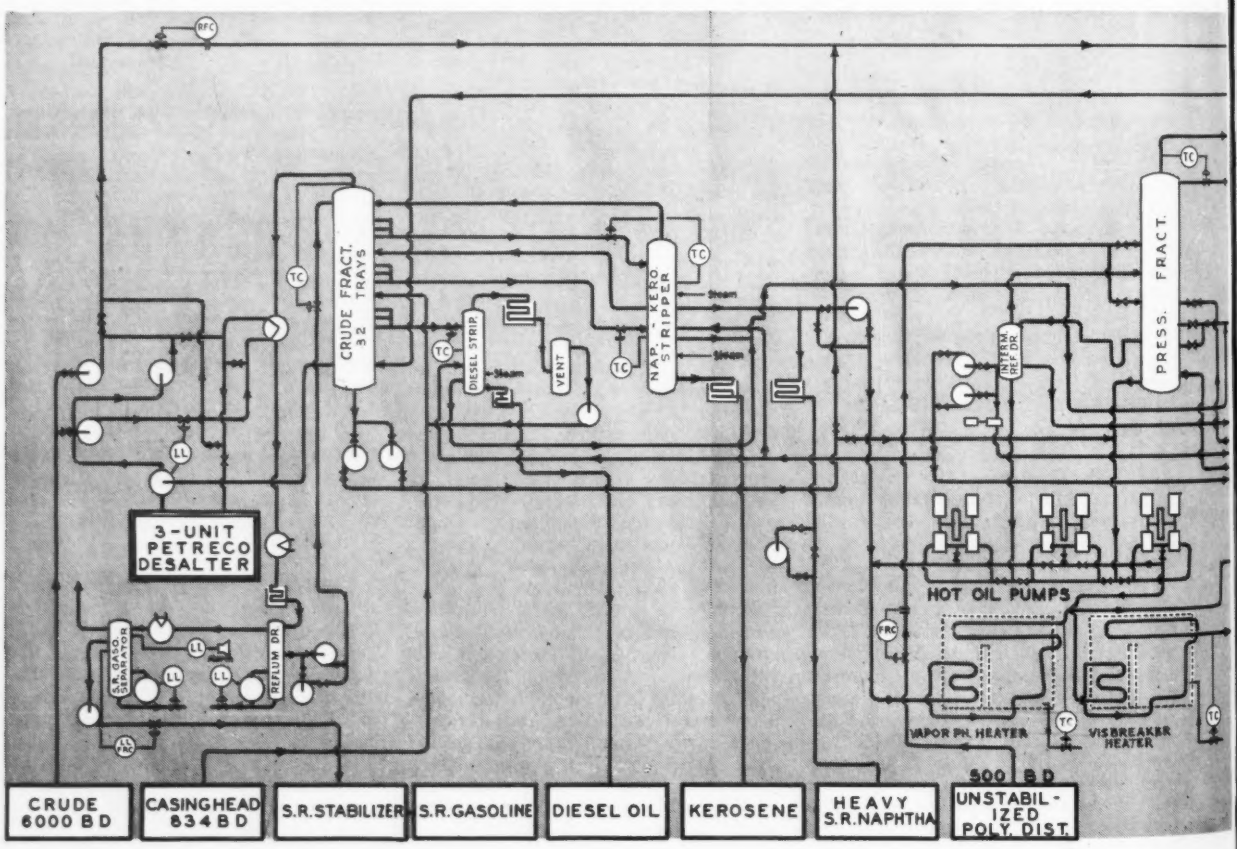
by R. B. Tuttle

MAINTAINING operational continuity in the near-100-per cent range for the manufacture of essential products during war time, the Continental Oil Co.'s refinery at Wichita Falls, Tex., was shut down soon after the war's end for extensive study of the need of equipment replacements. Operating throughout the emergency years with a minimum of replacement items the refinery's maintenance program was a matter largely of emergency repairs. Well within the limits of safety such repairs that were made to the refinery's various processing equipment were in keeping with the nation's efforts to conserve construction materials and in consequence the study revealed a large number of replacements were justified economically for postwar operations.

Weighing the costs of streamlining the refinery's combination unit with those of replacing various items the company engineers found that little additional investment was required if the streamlining was made at the time replacements were installed. Also, certain major changes in the original unit which would provide broad operating flexibility could be made at small cost at the time the other work was being done. Acting on the recommendation of their technologists Continental's management authorized the plant's revision early this year and construction started soon thereafter. Test runs well under way by early June indicate the unit has good stability with a wide range of flexibility.

On a design basis the unit is balanced to process 6,000 bbl. per day of North Texas crude averaging about 40.7° A.P.I. gravity and containing approximately 150 lb. of salt per 1,000 bbl. Desalting is carried out in a Petreco 3-unit installation rated at 7,500 bbl. per day capacity. A surge tank connected into the outlet of the de-

In new arrangement of old equipment, 6,000



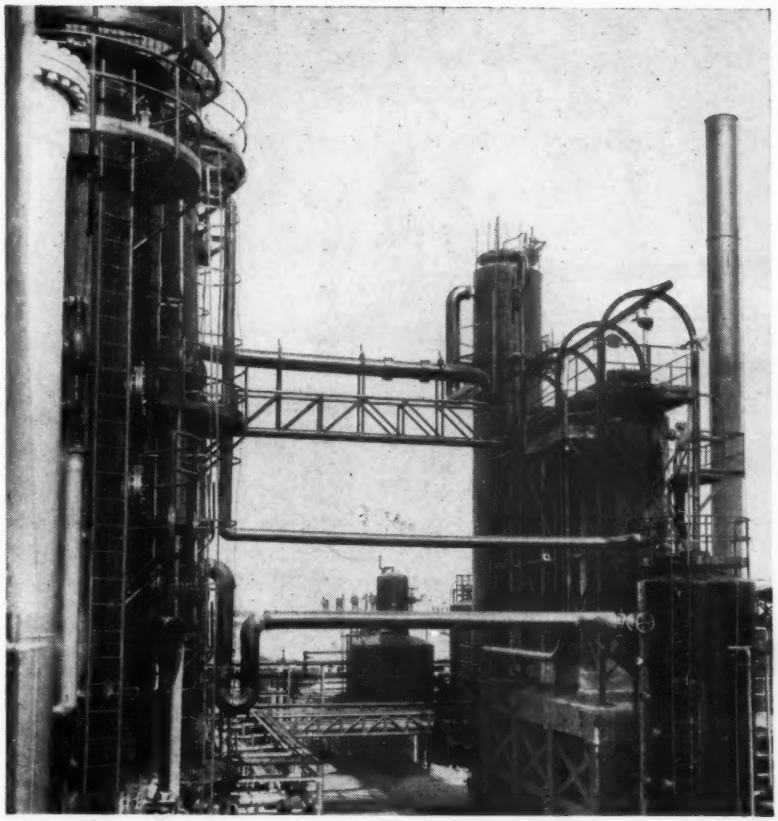
salter unit serves to balance the delivery of the desalter charge pump with that of the crude pump. Capacity of the desalter pump, a new electric motor driven unit, is given as 200 gpm. whereas the crude pump and its standby are rated at 190 gpm. each. These two units, also equipped with electric motor drives, have been in continuous service for more than 7 years. A liquid-level controller, which maintains a given volume of crude in the surge drum by throttling the desalter pump discharge, equalizes automatically the deliveries from the two different pumps.

Before entering the desalter the crude passes through a 615 sq. ft. exchanger which is manifolded so that heat pickup may be made after the crude is desalted, when desired. Normal pressure drop through the exchanger is about 15 psi. and temperature rise for the crude is indicated to be near 95° F. Overhead vapors from the crude tower are on the shell side of the exchanger, a single-pass unit. Temperature of the vapors entering this unit are shown to fall in the range of 250° F. and that of the material leaving at 228° F. Heat pickup in the second bank of exchangers raises the temperature of the crude to about 340° F.

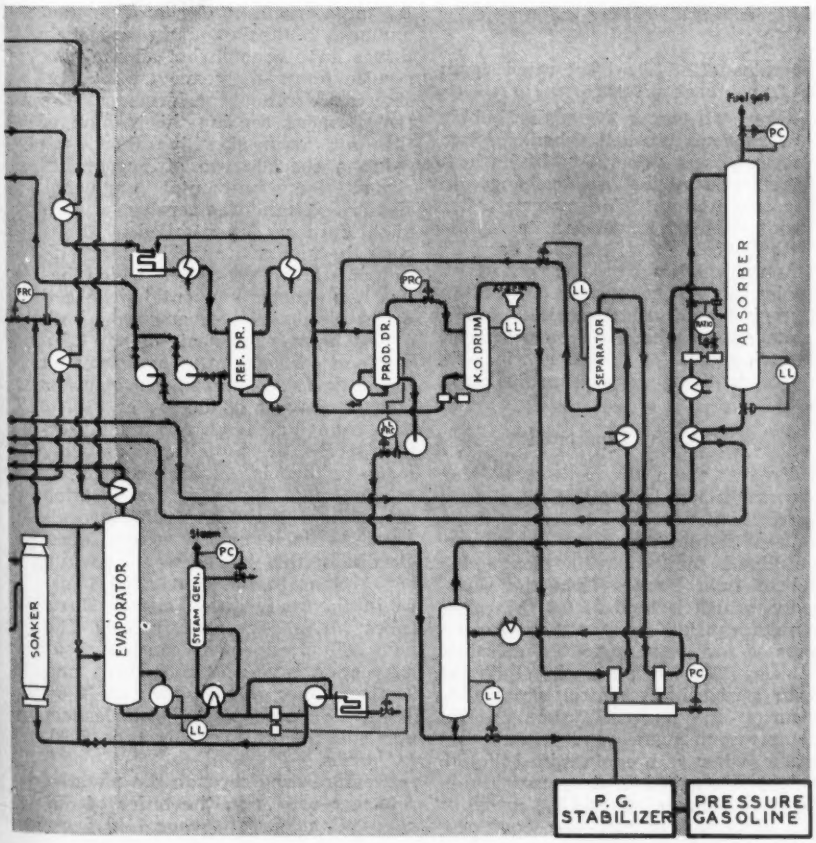
One previously used exchanger and one new 895 sq. ft. unit make up the second crude bank which transfers heat from the pressure tower overhead to the crude. Vapor temperature drop through the two exchangers is shown to be in the range of 80°-85° F. After passing through the third exchanger bank, a 615 sq. ft. unit, the crude is raised to 420°-425° F. by the heat from the cycle gas oil which is employed for side refluxing the pressure tower and for other purposes.

Final heating of the crude before it enters the bubble tower is carried out in a battery of two exchanger units, each of which has 328 ¾-in. by 16 ga. stainless-steel-type 304 tubes and 4-6 Cr. tube sheets. These exchangers have four tube passes and single-shell passes for the evaporator overhead material. Temperature drop on the overhead is indicated to be within the range of 85°-90° F. and for the crude side the rise is shown to be from 75° to 80° F. Pressure drop on the tube side of these units, which are connected in series, is in the order of 25 psi. for normal conditions.

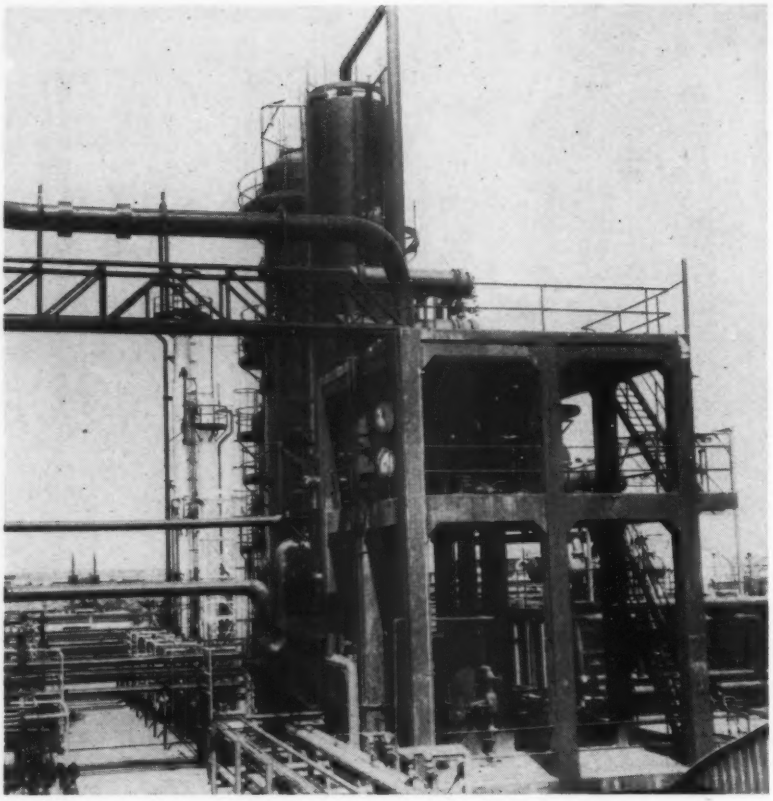
The bubble tower was constructed by extending the shell of an existing



bbl. per day of crude oil are efficiently processed



The vessel in the foreground, the unit's gas-oil accumulator, is located across the areaway and opposite the pressure bubble tower. One of the three vessels resting on the structure is used in current operations. Before the unit was revised all three of these vessels operated as reactors. Located beyond the three old reactors is the unit's evaporator



Beyond the structure in the foreground are the pressure and crude bubble towers and the diesel and kerosene-naphtha strippers. The columns in the background are in the refinery's stabilizer unit

vessel and installing 32 new Glitch truss-type, stainless-steel trays. Used previously as a naphtha tower the shell, from which the bubble tower is constructed, is 10-ft. i.d. and with the extension is 64 ft. long, exclusive of its skirt. Specifications for the bubble tower trays call for a weir length of 11-ft. minimum, slot area of 9.0-sq. ft. minimum and a riser area of 7.8 sq. ft. minimum plus 12 per cent maximum. Except at the inlet, diesel oil lower drawoff and the points of location for the manways, all tray spacing is at 1 ft., 6 in. Spacings at the manways are 2 ft., at the diesel oil drawoff 2 ft. 6 in. and at the inlet 3 ft.

Crude at 600° F. is fed into the the tower between the third and fourth trays and a diesel oil cut may be taken from trays 8, 10 or 12 as desired. The kerosene side stream may be taken off of trays 14, 16 or 18 and naphtha takeoff may at trays 22, 24 or 26 as required to meet specifications.

Bottoms are pumped from the tower, with a 2-stage motor-driven centrifugal unit, to one of the hot-oil pumps serving the vis breaker. The standby unit for crude tower bottoms is the same as the regular pump used in this service except that it is equipped with a turbine drive which operates with 150 psi. saturated steam at 20 psi. back pressure.

Overhead vapor from the bubble tower passes through a bank of two precondensers after some of its heat is removed by the first exchanger in the crude circuit. The material after leaving the precondensers, two units with 762 sq. ft. of surface each, is taken through a box-type condenser-cooler to a reflux receiver. The reflux pumping equipment consists of two units, one of which is driven with an electric motor for regular service and the other, the standby, is turbine powered.

Separator Equipment

Product from the reflux receiver passes through a bank of previously used tubular cooler-condensers to a separator from which the straightrun gasoline is pumped to the plant's stabilizer unit. Vapors from the separator, which is held at 0.5 psi. pressure, are picked up by a 2-stage compressor for delivery to the deisobutanizer. The separator is equipped with a high-level control which disconnects the ignition system on the compressor engine and sounds an alarm when a predetermined liquid height is reached in the vessel. Both vessels—the receiver and the straight-run gasoline separator—are equipped with external-type gasoline-water separators.

Overhead from the diesel stripper is returned to the bubble tower above its 14th plate after passing through a box-type cooler-condenser; bottoms from the stripper are run to storage from a cooler box. Gas oil from the pressure tower supplies the heat for the stripper which handles about 300 bbl. per day of diesel oil product.

Steam-stripped naphtha is charged to the reforming unit at a rate of near 1,000 bbl. per day and is pumped from the stripper to the discharge side of one of the hot-oil pumps with a Byron Jackson "Hydropress" 20-stage unit driven with a turbine. When running to storage the naphtha from the stripper passes through a box-type cooler before it is picked up by a pump.

Kerosene make averages nearly 550 bbl. per day from the stripper column. The heating element for the kerosene stripper, like that of the diesel stripping column, is a U-tube unit which is installed in an opening in the vessel shell. Both units are heated with the same gas-oil stream which is split into parallel flow to the respective heaters. Kerosene flows by gravity, via a box-type cooler, to storage.

Reciprocating Units

The hot-oil pumps for the vis breaking and naphtha reforming section of the combination unit are reciprocating units driven by Corliss compound engines. Both the pumps and their drives have been in hot-oil charging service for many years yet are still showing excellent performance. The two furnaces serving this section of the unit are fired with refinery gas using a special type of burner designed by Continental engineers. Heater coil outlet temperature at each of the furnaces is controlled by throttling the fuel gas to the burners with a temperature controller which has its thermometer element in the coil outlet piping. The streams from both of the heaters enter at the top of a common soaking drum and then on to the lower section of the evaporator from the bottom of the soaker.

In changing the unit over for present operations, no alterations were made to the vis breaking furnace or to its coils. However, the naphtha reforming furnace and coil were altered to include new floor tubes. Originally this heater was made up of 36 tubes in the convection bank, 64 in the roof section and no floor tubes; all tubes were 4 by ⅜-in. The new coil arrangement consists of 54 convection tubes; 72 roof tubes and 24 floor tubes, all of which are 4 by ⅜-in., "Sicromo No. 3"; all leaders and coil fittings are Key type 7000, 125 series.

Pressure drop through the naphtha reformer coil is in the order of 350

(Continued on page 112)

Unusual Pressure Conditions Solved in Oklahoma's Second

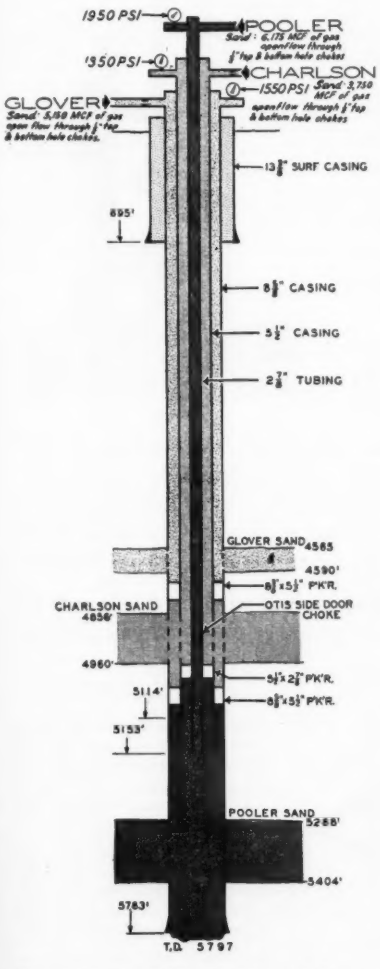
TRIPLE-ZONE COMPLETION

by E. H. Short, Jr.

RECENT skillful completion of Oklahoma's second triple zone well was accomplished with a degree of proficiency paralleling Greater Gulf Coast methods where this type of completion was pioneered and developed. This well, 1 McCaughtry, located in the Chickasha field of Grady County, was completed by the Anderson-Prichard Oil Corp. to produce simultaneously from the Glover, Charlson and Pooler sands.

The well was drilled to a total depth of 5,797 ft. and 8⅝-in. casing was set and cemented at 5,783 ft. This casing was then perforated at points opposite the three producing horizons. The first sand, or the Glover section, occurred from 4,566 ft. to 4,590 ft.; the intermediate pay, or the Charlson sand, from 4,856 to 4,960 ft.; and the lower zone, or the Pooler sand, occurred from 5,288 to 5,404 ft.

When the well was placed on production the Glover sand produced 5,150,000 cu. ft. of gas a day through a ½-in. choke at a surface pressure of 1,550 psi.; the Charlson sand gaged 3,750,000 cu. ft. of gas a day through the same sized choke, with a surface pressure of 1,350 psi.; and the lower Pooler sand produced 6,175,000 cu. ft. per day through ½-in. top and bottom chokes at a surface pressure of 1,950 psi.



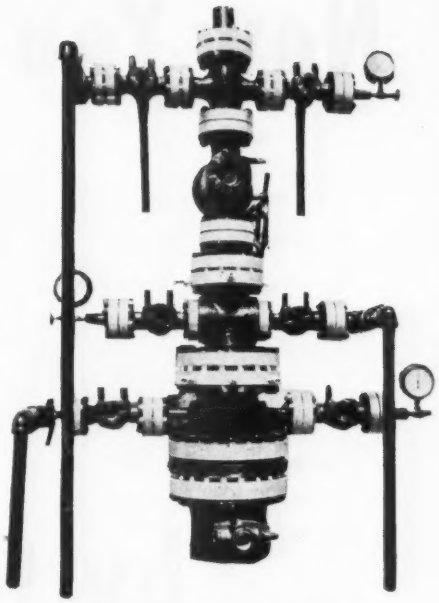
Diagrammatic sketch showing piping arrangement and packer settings in three-zone completion

Completion Program

In completing the well in the three zones 5½-in. casing equipped with two Lane-Wells packers was run to a depth of 5,114 ft. Perforations in the 5½-in. were opposite the 8⅝-in. perforations which exposed the Charlson sand. The two 8⅝-in. x 5½-in. packers were spaced so that with the 5½-in. at 5,114 ft. the upper packer (disk type) was between the upper and intermediate zones, and the bottom packer (hookwall type) was at a point slightly below the intermediate zone.

Because of the low pressure of the intermediate sand, difficulties in keeping the lower 8⅝ by 5½-in. hookwall packer seated were anticipated. To make sure this packer would remain seated, the 5½-in. casing was screwed into the bottom of the tubing head and the packers were set so that, with the full weight of the 5½-in. on the packer, there was still approximately 2 in. clearance between the tubing head body and the intermediate spool. Extra long stud bolts and nuts were used to take up this clearance and increase the force holding the packer down.

At the time the 5½-in. was run, the hole contained 9.1 lb. mud. Therefore, in order to bring in the upper sand, gas at 1,150 psi. was injected into the annulus between the 8⅝-in. and 5½-in. before the packers were closed. Approximately two-thirds of the mud in the annulus was flowed out, the 8⅝-in. packers were closed,



Anderson-Prichard et al 1 McCaughtry in Section 35-5n-8w, Chickasha field, Grady County, Oklahoma. The christmas tree controls gas production from the Glover, Charlson, and Pooler sands

and when the gas pressure was removed from the annulus the upper zone came in, blowing the remaining mud out through the tree. The mud left in the 5½-in. prevented the Charlson and Pooler sands from coming in.

Special Casing Packoff

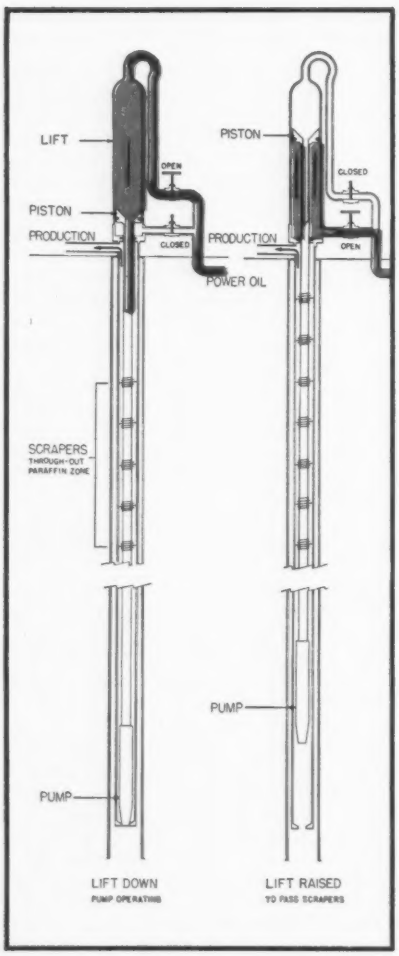
Since the pressure from the Pooler sand had to be confined by the casing spool while the packers were being set, a special 5½-in. casing packoff was made. This packoff was an enlarged version of the McEvoy type AG tubing hanger which permits the movement of the unpolished pipe under pressure. It was held in place by set screws in the upper flange of the casing spool.

The next step involved running a 5,153-ft. string of 2⅞-in. tubing equipped with an Otis side-door bottom-hole choke. A 5½-in. by 2⅞-in. Lane-Wells packer (spaced in the string just below the side-door choke) was then set below the perforations in the 5½-in. casing opposite the Charlson sand.

With the side-door choke in an open position, gas at 1,150 psi. was injected down the annulus between the 2⅞-in. tubing and 5½-in. casing. The mud in the annulus entered the tubing through the side-door choke and was flowed out through the tubing. When the gas pressure was released, and the side-door choke closed, both the middle and lower zones came in.

This well is on a unitized lease in which Cities Service Oil and Little Nick Oil companies own an interest.

Now You Can REMOVE PARAFFIN by the Turn of a Valve



NEW HYDRAULIC LIFT Provides a Quick Inexpensive Means of Disposing of Wax

A new easy-to-operate method of controlling paraffin in pumping wells, that greatly reduces pumping costs, where wax is a production problem, is the latest contribution of *Fluid Power*. It consists of a lift that makes use of the hydraulic power on the lease to raise and lower a series of scrapers positioned in the production tubing.

The lift does away with the need for extra equipment and extra manpower previously required, and eliminates costly down-time.

To dewax the tubing, all that has to be done is to open and close two valves. This raises and lowers scrapers through the paraffin zone, breaking loose the accumulated wax so it can be pumped out with the production. The pumper can perform this duty, requiring only a few minutes, during his regular tour of the lease. Periodic operation will keep the production tubing free of heavy wax deposits.

This is a new development in pumping that you will want the details on. Call your nearest Kobe representative who will be glad to give you performance facts.

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SOLUBLE PLUGS

Lead lines also can be kept clear of wax with another of Kobe's new products, Soluble Plugs. These plugs are inserted into the lines and forced through with "*Fluid Pressure*". They are strong enough to clean out the wax, yet sufficiently flexible to conform with abrupt changes in pipe direction. They dissolve after a few hours in crude oil.

KOBE, Inc.—*General Offices:* Huntington Park, Calif. *Division and District Offices:* Bakersfield and Huntington Park, Calif.; Oklahoma City and Tulsa, Okla.; Brownfield, Dallas, Houston, Longview, Odessa and Wichita Falls, Texas; Great Bend, Kansas; New York, N. Y.

Engineering Factors and Operating Problems in the East Texas Field

PART 2 OF A SERIES

*by W. S. Morris**

Salt-Water Disposal

METHODS of handling salt water by the East Texas Salt Water Disposal Co. will be described here, together with a discussion of the operating problems and engineering factors involved. The Salt Water company takes the salt water from the gunbarrel or treater on the individual leases, transports the water through its own gathering systems to collection centers, thence to treating plants and into the injection wells. The processes and methods used are discussed from the time the water is first received by the company.

Although there are a few "closed" systems for handling salt water in the East Texas field, the "open" type system predominates and is the only type system now used by the Salt Water company. The "closed" system has been used in East Texas with success but its use is confined to leases where pressure-type treaters are used and where the operator of the salt-water disposal plant has control over conditions on the lease. When a system can be operated so that no air is permitted to enter the lines and other equipment, the problem of salt-water disposal is somewhat simplified.

*Vice president and general manager, East Texas Salt Water Disposal Co., Kilgore, Tex.

Design of Gathering Systems

When oxygen in the air is permitted to come in contact with salt water, the result is that the salt water becomes highly corrosive. When chlorine and other chemicals are added to the salt water its corrosive nature is further enhanced. The use of steel pipe for salt water gathering lines is prohibitive because of the short life of steel for this service. However, steel pipe can be successfully cement lined to withstand the action of salt water. There are many steel lines, cement lined, in use where considerable pressure is required. The steel pipe is usually lined with lumnite or pozzuolana cement. The tubing used in the injection wells likewise is generally cement lined although some recent experiments have been conducted with plastic-lined tubing.

The salt-water gathering system of lines is usually laid so that water will flow by gravity from the gunbarrel or treater on the individual lease to a central point. The operator is required to install a spill pipe, 10 in. in diameter, as part of the water leg at his lease treating tank. On the discharge side of the spill pipe is the point where the Salt Water company begins its installation. A standard meter run is installed, on the downstream side of which is a vented goose neck for the release of any air or gas that may have come through the spill pipe and meter run.

In general, asbestos cement pipe is used throughout the gathering system. The lateral lines to individual leases are a minimum of 4 in. in diameter although if the lease is producing a sufficient volume of water, 6 in. or 8 in. pipe is used as conditions require. The main lines or trunk lines are also of asbestos cement, the sizes of which are determined by the available head and the volume of water to be handled.[1] Some of the main lines of the company are as large as 12 in. in diameter.

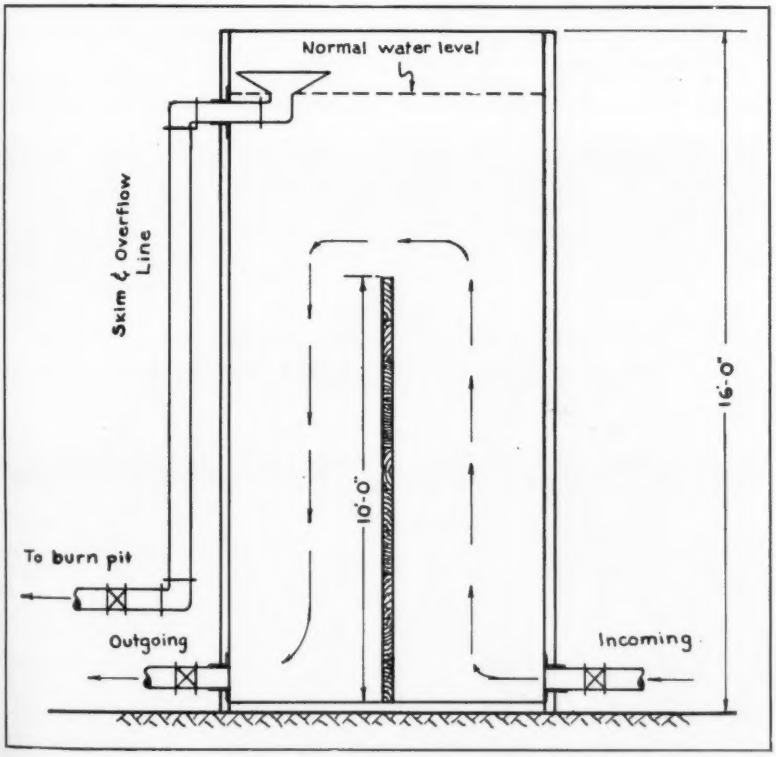


Fig. 1—Sectional view of skimming tank

Two Types of Couplings

There are two types of couplings used for connecting the joints of asbestos cement pipe. One make of asbestos cement pipe uses a sleeve made of asbestos cement which is slipped over the joint with a rubber ring on each side of the joint. A special tool or jack is used in making up the joint but the pipe can be laid very easily with an experienced crew and the joints have been very satisfactory as far as leaks are concerned. The other type of joint is a flexible type coupling wherein an asbestos cement center ring is used with a rubber ring on each side using a cast iron follower fastened togther with three bolts. Joints of this kind are easily installed in close places, and where fittings are used such couplings have been found most desirable.

In reclaiming a cement asbestos line it has been found necessary in practically every case, to discard the rubber rings of both types because of the permanent distortion of the rings. Where the flexible-type coupling is used the bolts also have to be replaced if the line has been in use for any considerable length of time. The gathering lines are laid to grade wherever possible and usually buried to a depth of not less

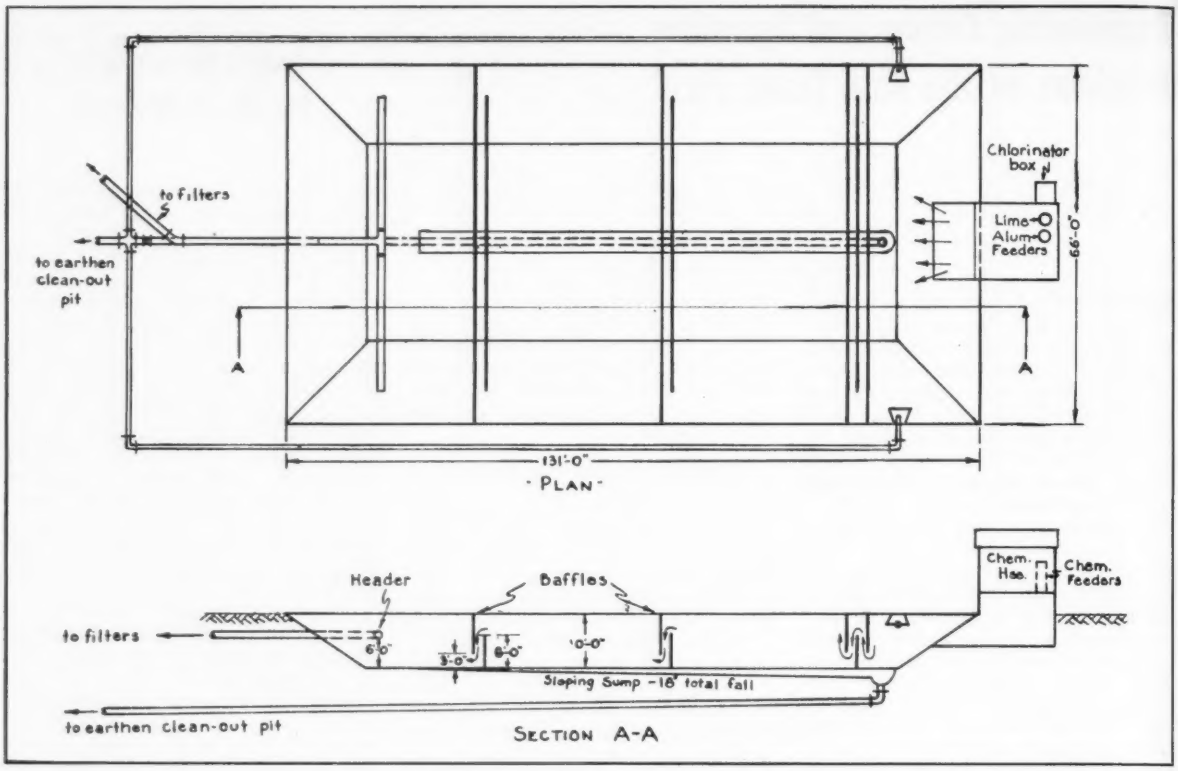


Fig. 2—Sketch of salt-water-treating plant

than 18 in. Whenever it is necessary to have high places in the line, a vent is necessary to prevent the accumulation of gas or air which would cut down the capacity of the line.

While every effort is made to prevent oil, sludge, and other foreign material from entering the salt water lines, they cause a great deal of trouble and special tools have been devised for regularly cleaning the lines. The earlier practice of cleaning lines included the use of hydrochloric or sulfuric acids, but the use of acid has been practically eliminated principally because of the danger to the workmen. Where a line is particularly dirty, it is cleaned by the use of a scraping tool on the end of rotating rods such as used in the cleaning of municipal water lines. The routine cleaning of lines is done by the use of a scraper especially designed by engineers of the Salt Water company. The scraper has many of the general characteristics of those used in cleaning oil pipe lines although the salt water scraper is considerably more flexible and can go around 90° turns. The line to be scraped is taken apart, the scraper inserted and a wire line attached. The wire line is connected onto a measuring device so that if the scraper stops at any place in the line the exact point can be readily located. Salt water is pumped into the line behind the scraper to flush the loosened material on through the line.

The company has approximately 200 miles of salt water gathering lines in the East Texas field and two crews are kept constantly on the job keeping the lines clean.

The asbestos cement gathering lines bring the water by gravity flow from

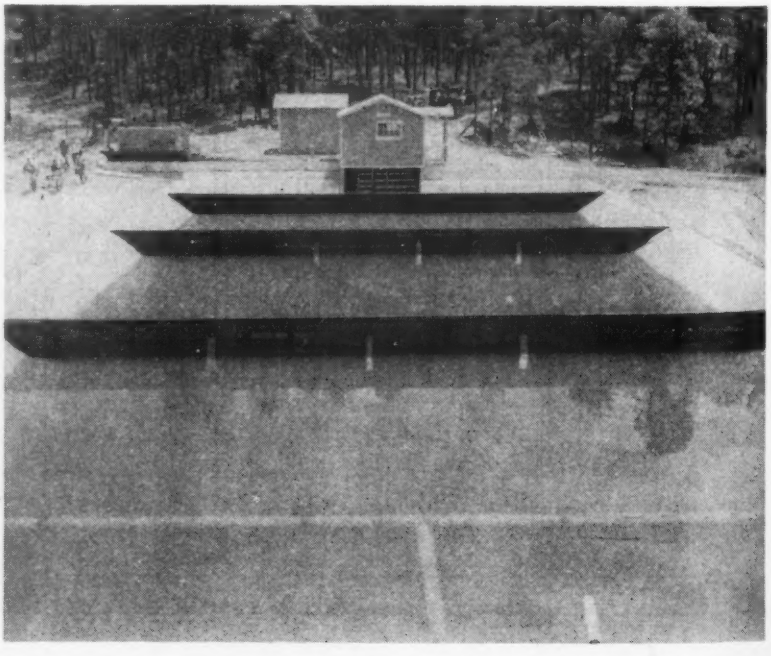


Fig. 3—Salt-water-treating plant, Morris system. In left foreground is the 14-by-14-ft. wooden aerator which receives water from skimming pit. Water then passes under chemical house in center where it is chlorinated, alum and lime added and discharged into far end of main treating pit. The gunite treating pit is 66 by 133 by 10 ft.; capacity 10,700 bbl. The three "over and under" baffles are shown together with outlet header

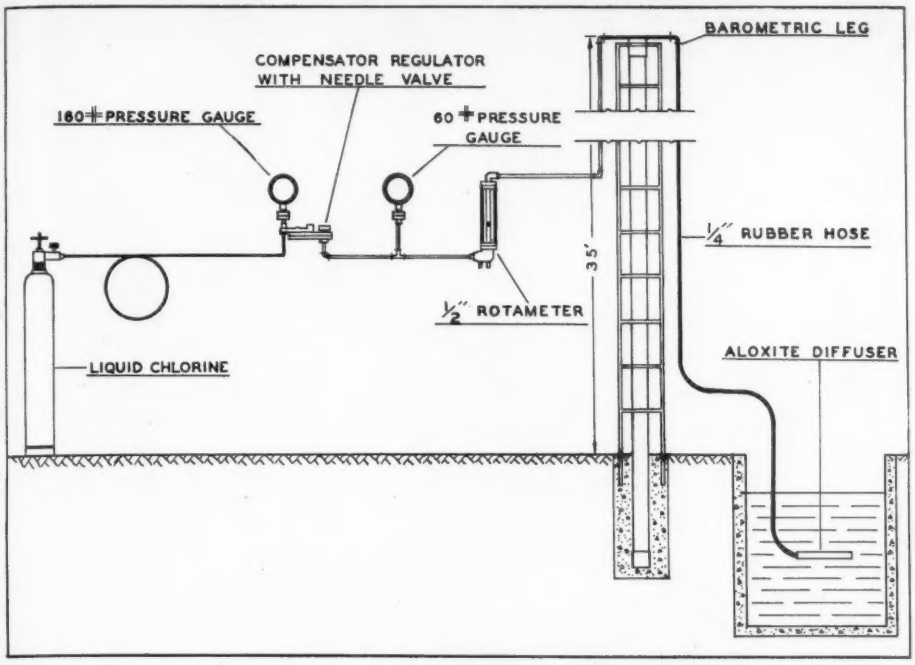


Fig. 4—Liquid chlorine dispensing assembly

individual leases to collection centers. These centers may consist of a 250-bbl. redwood tank or an 8,000-bbl. gunite concrete pit as conditions require. At the collection centers, the oil is skimmed from the water and in many instances chlorine is added to control the growth of algae and bacteria in the water. When a redwood tank is used as a collection center, it has been found more desirable to use a tall tank rather than a low tank to increase the efficiency of skimming the oil. Fig. 1 shows a sectional view of a skimming tank. The water comes in at a point near the bottom of the tank and rises over a relatively high wooden baffle in the center of the tank, thence down on the other side to the outgoing connection. The oil is skimmed from the water level through a funnel device.

Where large gunite pits are required for collection centers the water usually enters through a series of two compartments designed to permit the skimming of the oil. From the skimming pits the water passes over an aerating slab thence through the chlorinating pit before entering the main collection pit. The aeration and chlorination of the water is a part of the chemical treatment and is discussed later.

From the collection centers the salt water is pumped to the treating plant where it is again aerated by being discharged over the top of an aerating tower. The water is broken up into small droplets in this tower to permit contact with the air. An experiment is now being conducted wherein a forced draft aerator is used. Approximately 40,000 cu. ft. of air per minute are passed through the tower by means of a large ventilating fan. Approximately 15,000 bbl. of water per day passes through the tower. In addition to the more complete aeration in the forced draft tower, the temperature of the water is also reduced approximately 20° F. which is a beneficial effect. Through an ordinary aerating tower the temperature loss is approximately 5° F.

Where the water flows to the treating plant by gravity from the surrounding leases it may not be possible to utilize an aerating tower without use of pumps for lifting the water. In such cases, aerating slabs are used and the water spread out to a depth not to exceed ½ in. In cases where additional aeration is required blowers are utilized to discharge air below the surface of the water.

The purpose of aeration is to obtain an intimate mixture of the salt water with air since the degree of oxidation will be proportional to the absorption of oxygen from the air.[2] After the water has been aerated, chlorine is added in the chlorinator box. Fig. 2 is a layout of the salt-water treating plant used by the Salt Water company.

After receiving a charge of chlorine, lime and alum are added to the water before it enters the first section of the main treating plant through a series of baffles designed to reduce the velocity of the water. In Fig. 2 it may be observed that there is a sump in the first section of the gunite pit so that the sludge which accumulates in this section can be easily drained off to clean out the pit. The water must travel through an under baffle, an over baffle and another under baffle to pass into the second section of the treating pit.

Similarly the water must pass

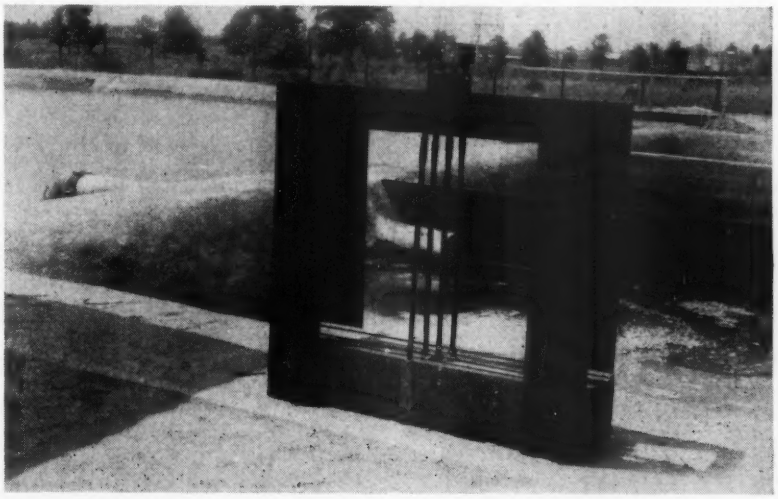
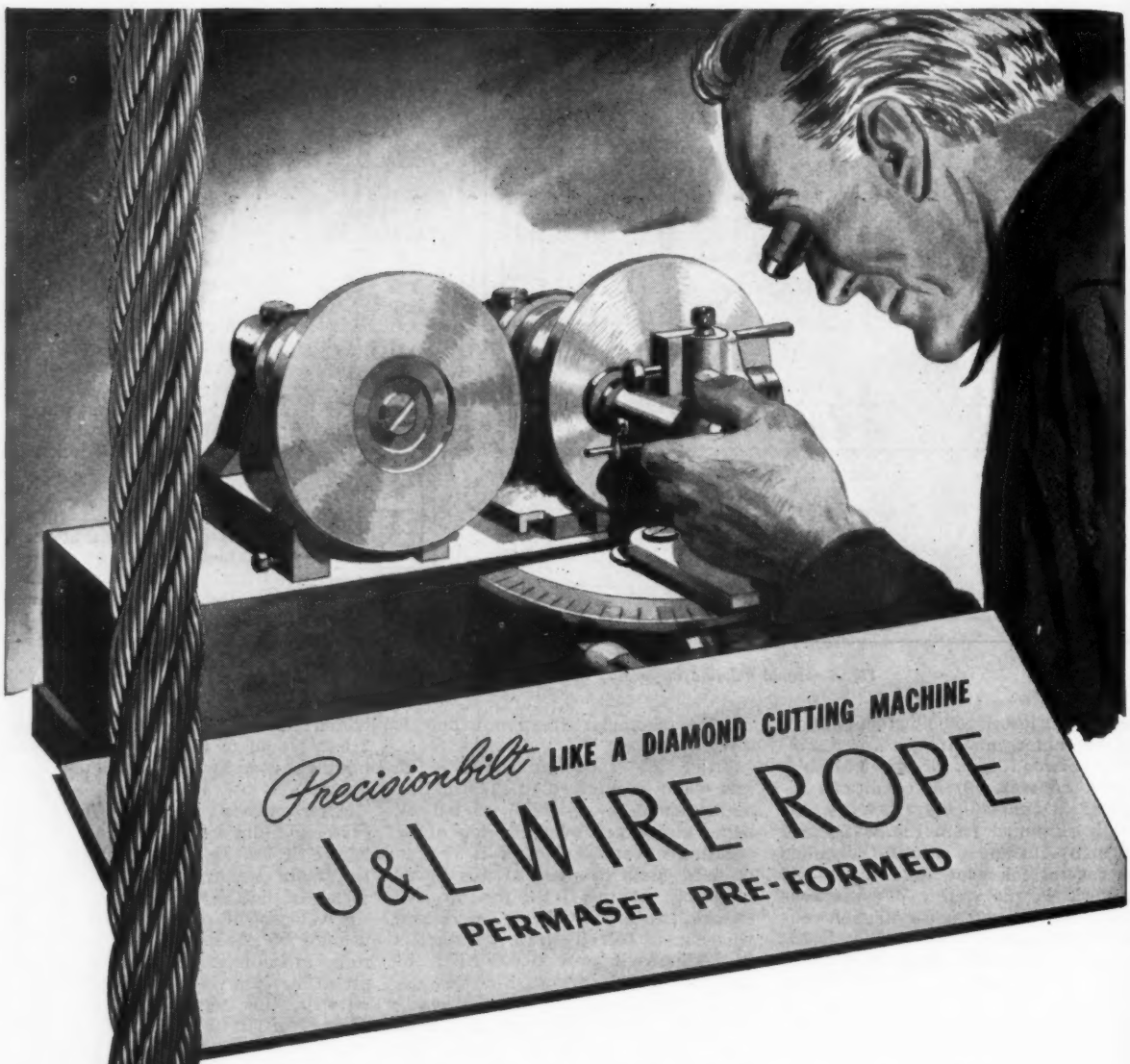


Fig. 5—Submerged electrodes (five plate, carbon graphite) for chlorine generation. Plates are treated by manufacturer to reduce normal porosity of about 30 to less than 1 per cent. Plates are submerged from 18 to 24-in. below surface of water. These electrodes are connected to a rectifier to complete the electrolytic unit used in generation of chlorine



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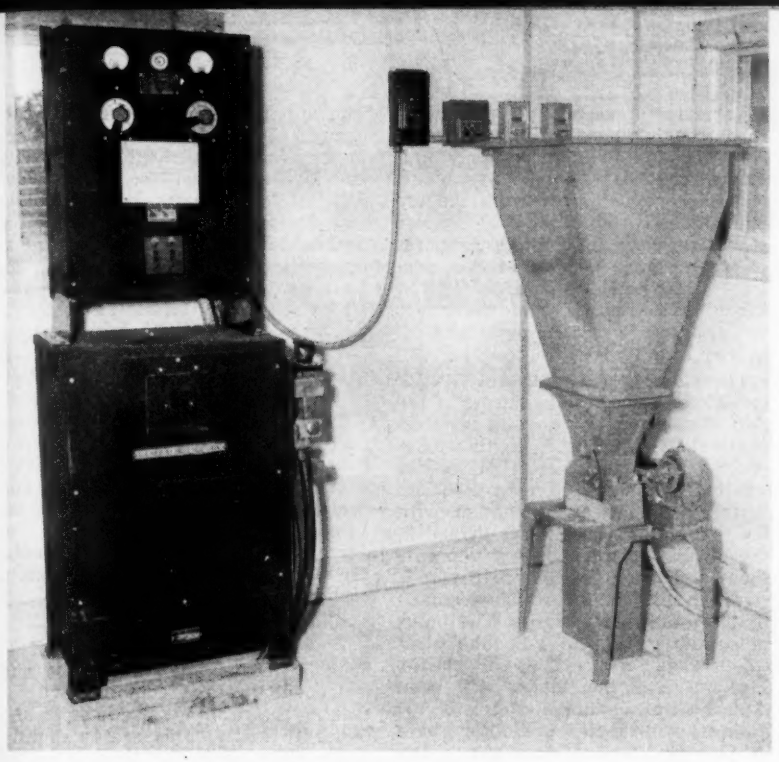

Fig. 6—The 6-volt, 500-amp. air-cooled G. E. rectifier (left) converts 3-phase, 400-volt electric current to 6-volt, 500-amp. direct current for electrolytic generation of chlorine. The Bachrach dry chemical feeder (right) feeds alum and lime into water. It is electrically operated

through another series of baffles consisting of an over baffle and an under baffle in order to pass into the third and fourth sections of the pit. The heavier floc is retained in the bottom of the pit with the clearer water passing into the next subsequent compartment of the treating plant. By th time the water reaches the last section of the treating pit it is usually free of all floc, oil and many other impurities. From the header in the last section of the pit the water goes to the filters, usually by gravity, but otherwise by the use of centrifugal pumps. The handling of treated, settled water from the pits to the filters is important, and it is agreed that turbulence is undesirable. If the water is well treated and settled, an efficient filter will remove all solids.

Treating plant data covering the various systems operated by the company for May 1946, are shown in Table 1. The average injection factor was 19.2. The higher the factor the better the operation. On some of the systems the factor ran as high as 34.6 and as low as 6.9. This factor for 1944 on all injection wells averaged 17.0 and for 1945 the average was 18.6. The best month for injection in 1944 was February with an average injection factor of 20.0 and the worst month was June with 15.1.

During 1945 the best month was December with an average injection factor of 22.0 and the worst month was September with 16.1. Unquestionably the quality of the water introduced into the wells determines the injection factor. It has been observed over a period of years that the injection factor is higher in the colder weather than in the warmer weather. Investigations indicate that this difference is due to the effect of temperature on the chemical reactions in the water.

Chemistry of East Texas Salt Water

The chemistry of East Texas salt water is complicated if all the reactions that may take place while it is being produced, handled, treated and injected are considered. There are some reactions known to take place and a number of side reactions that might take place. It is misleading to consider the fluid under discussion merely as water, as it is an aqueous solution of salts, mainly sodium chloride but the reactions, stability and solubilities are different from fresh or nearly pure water in many instances. The analysis of East Texas salt water taken as a composite sample is shown in Table 2.[3]

The pH of the water averages 7.2 when received by the Salt Water company. The specific gravity is about 1.042 at 70° F.

The salt water as produced is saturated with hydrocarbon gases and the iron is in solution in a reducing or ferrous state. Upon oxidation the ferrous iron changes to insoluble ferric iron which is removed by sedimentation and filtration.

Treatment With Chlorine

After the water has been aerated, chlorine is added as a further oxidizing agent in an effort to control the growth of bacteria in the water. The bacteria most commonly found in East Texas salt water is the anaerobic sulfate reducing type identified[4,5] as vibrio thermodesulfuricans which thrives at temperatures between 80° F. and 140° F. The chlorine used in the treatment of salt water either is generated by the electrolysis of the salt water or liquid chlorine diffused into the water through porous thimbles. When adequate aeration is obtained it is possible that the addition of chlorine can be eliminated.

The first and simplest dispensation of liquid chlorine consists of a check valve and copper tube to a diffuser

TABLE 1—TREATING PLANT DATA FOR MAY 1946

			Filters (g.p.m./sq. ft.)		Water tests (p.p.m.)				
	Through-	Settling			Filtered			Suction	Injection factor*
System—	put (B/D)	time (hrs.)	Average filtered	Back-wash	pH	Cl	Iron	iron	May 1946
Albertson	14,400	18	2.7	13.0	7.3	1.2	.1	1.0	32.2
Bell	5,500	Infilco	2.4	9.1	7.4	1.4	.2	1.1	8.6
Blum	8,700	26	2.5	17.5	7.2	.3	.3	2.3	34.1
Christian	10.200	8	3.0	12.2	7.3	1.3	.1	2.0	25.9
Condra	15,100	17	2.9	11.3	7.2	1.4	.1	.8	31.9
Everett	12,100	34	1.8	...	7.2	.5	.2	1.8	23.1
Frame	13,800	19	2.7	12.6	7.4	.9	.1	1.0	18.8
Gladney	9,000	28	2.6	...	7.3	1.2	.1	1.3	17.5
Hardwicke	9,600	24	2.8	11.3	7.3	1.0	.1	2.2	20.5
Kee	9,600	21	1.9	11.7	7.2	1.1	.1	1.1	24.0
King	5,300	13	2.8	6.0	7.4	.8	.1	2.3	8.8
Layne	8,050	47	2.3	9.9	7.2	.8	.1	1.7	18.8
Morris	4,600	56	1.3	12.2	7.3	1.5	.1	1.0	11.3
Moyar	13,650	19	2.6	10.9	7.3	.8	.1	.8	34.6
Nicholson	5,130	Infilco	1.8	...	7.3	.8	.2	1.2	6.9
O'Donnell	13,900	19	4.0	9.5	7.0	.8	.1	.9	27.3
Pace	8,240	29	2.4	12.2	7.1	.7	.5	3.3	26.2
Payne	31,600	16	2.3	12.6	7.3	.7	.1	1.0	14.7
Pew	12,900	15	2.5	12.0	7.3	1.5	.1	1.4	24.8
Ramey	6,440	57	1.9	...	7.3	1.1	.1	3.3	14.1
Shaw	9,850	23	1.9	10.0	7.2	.9	.1	1.8	17.7
Starnes	12,100	18	2.3	...	7.2	.8	.1	1.2	29.5
Suman	7,070	32	2.1	10.9	7.3	.3	.1	1.7	9.2
Thomas	7,070	8	2.7	13.9	7.3	.6	.9	2.6	16.1
Walker	4,660	12	2.7	...	7.2	1.2	.1	1.7	9.9
Warren	7,800	6	2.3	...	7.4	.3	.2	.9	12.7
Zeppa	39,800	16	2.3	8.6	7.2	.5	.2	2.0	16.5
Average	11,300	23	2.4	...	7.3	.9	.17	1.6	19.2

*Injection factor is barrels per day per pound differential bottom-hole pressure.

TABLE 2 — ANALYSIS OF WOODBINE WATER FROM EAST TEXAS FIELD

Constituents—	Parts per million	Percentage reacting value
Total solids	64,725	....
Iron and aluminum	14	....
Sodium	23,029	44.99
Calcium	1,352	3.03
Magnesium	536	1.98
Sulfate	216	0.20
Chlorides	39,000	49.42
Carbonates	0	0.00
Bicarbonates	578	0.38

Properties of reaction—	Per cent
Primary salinity	89.98
Secondary salinity	9.26
Primary alkalinity	0.00
Secondary alkalinity	0.76
Total	100.00

made by cementing an alundum extraction thimble into a hard rubber base tapped with a pipe thread. The needle valve on the chlorine cylinder was used to control the flow. Temperature variations in the cylinder exposed to the sun's rays and atmospheric changes, affected the pressure and rate of flow, making frequent regulation necessary and uniform flow almost impossible. When the cylinder became empty or nearly so, a temperature drop would cause a vacuum and salt water would be sucked into the cylinder causing it to corrode.

After the use of several special devices for dispensing liquid chlorine had been discarded, the Salt Water company devised the apparatus shown in Fig. 4. This assembly includes a ½-in. rotameter with a capacity of 10 to 50 lb. of chlorine per day.

The main difficulty in using liquid chlorine is the prevention of leaks. Iron or copper lines can be used as long as the chlorine is kept perfectly dry, but atmospheric moisture makes very small leaks increase greatly. The rotameter must be exactly vertical to function properly and must be cleaned every few months. Stone filters were originally used between the chlorine cylinder and the regulator, but appear unnecessary. The simplest and most dependable vacuum breaker seems to be a barometric leg a minimum of 35 ft. above the water level. The assembly should be housed with as much insulation as practical, heated during winter months and maximum ventilation in case of leaks.

Collection Centers

During the war when liquid chlorine was hard to obtain it was necessary to find other means of generating chlorine or substitute some other chemical treatment. It was more expedient and economical to generate chlorine by electrolysis of the salt water than to use other chemicals.

Electrolytic chlorination had been used in the East Texas field by some of the companies prior to the organization of the company.[6] The earlier installations used direct current generators and an electrode consisting of a series of carbon plates upright in a trough where salt water would flow through them at a fairly uniform rate. The copper terminals rapidly corroded away from the top ends of the carbon electrodes because salt water came up through the pores of the electrodes. Tops of the electrodes were boiled in paraffin to eliminate this trouble. The electrodes were spaced ¾ to 1 in. apart and required 7 to 10 volts to operate.

Through a period of several months' experimentation, the engineers of the Salt Water company devised the electrode shown in Fig. 5. In this piece of equipment the carbon plates are totally submerged on a wooden hanger with no metal contact with the water. The carbons are drilled in the middle, copper posts driven into them and plastic coated copper rods screwed into the posts. The connection is sealed with plastic. The bolts, nuts and spacers to hold the electrodes together are fiber or plastic. The porous carbon plates have been replaced by nonporous carbon eliminating the necessity of boiling them in paraffin. The carbon plates are 1¼ in. thick, 6¼ in. wide and 36 in. long; a group of five plates spaced ⅜ in. apart with bakelite insulators are connected with 1/0 solid copper wire.

The generation of chlorine by electrolysis employes low voltage, high amperage, direct current. The company now has in use four d.c. generator sets and 34 rectifiers which convert 440-volt 3 phase alternating current to 6-volt 500 amp. direct current.

When electric current is passed through salt water, sodium ions are liberated at the cathode and chlorine ions at the anode. The sodium ions react with water forming sodium hydroxide which in turn reacts with calcium to form carbonate which deposits on the cathode. The chlorine evolved is dissolved in the water as chlorine, or reacts to make chlorites, chlorates or chlorides. Chlorides are formed by the reaction of chlorine with the cathodic products. There are many possible complicated reactions[7] in the electrolysis that are not considered important in salt water treatment. The deposits on the cathode, usually calcium carbonate, necessitates the reversal of the current through the electrodes or it will deposit until it connects the two adjacent electrodes with the result that the efficiency is materially impaired. By reversing the electrode, the calcium carbonate reacts with chlorine, going back in solution as calcium chloride. The current is reversed at 4-hour intervals in the Salt Water company's operations.

After the salt water has been chlorinated, sedimentation can be greatly aided by the use of alum (aluminum sulphate, $Al_2(SO_4)_3$) and lime (calcium hydroxide, $Ca(OH)_2$). As the soluble iron and probably other components change to insoluble forms, they are in very fine particles, probably partly colloidal, settle very slowly and are difficult to filter out. Alum dissolves and hydrolyzes, forming aluminum hydroxide, $Al(OH)_3$, which is a gelatinous insoluble precipitate. This coagulates the small particles or floc which settle out more readily.

$$Al_2(SO_4)_3 + 6H_2O = 2Al(OH)_3 + 3H_2SO_4$$

$$H_2SO_4 + Ca(HCO_3)_2 = CaSO_4 + 2H_2O + 2CO_2$$

This alum floc is rather light, regarding the specific gravity of the solution especially if oil, gas or other organic compounds are in it, and therefore settles slowly or not at all. Lime, $Ca(OH)_2$, dissolves, then reacts with the calcium bicarbonate, $Ca(HCO_3)_2$, forming soluble calcium carbonate, $CaCO_3$.

$$Ca(OH)_2 + Ca(HCO_3)_2 = 2CaCO_3 + 2H_2O$$

This is heavier than alum floc and if formed together, combines with it making the resultant floc heavier and easier to settle. This seems slightly more effective if the lime is added and allowed to dissolve and mix before the alum is added, probably because the lime adds to the positive charge on the solids making them more attracted by the negative alum ions. For best results, chemicals must be adequately mixed with solution.

The lime and alum are fed into the salt water through dry chemical feeders such as shown in Fig. 6. These feeders are electrically operated and the rate of discharge of the chemical can be regulated. Where the flow of water through the chemical basins is intermittent, depending on the rate of flow into the collection centers, the chemical feeders are connected with float control switches so that the chemical will not be dispensed except when water is passed through the basins.

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Chemical Health Hazards in Modern Petroleum Refining

by Roy G. Benson and P. M. Van Arsdell *

ABSTRACT

DAILY contact with gasoline, lubricating oil, and other hydrocarbons whether confined to pipes, pumps, or gasoline tanks on automobiles has become so much a part of our daily life and thought that it is seldom the physiolcgical effects of the compounds are sharply brought to our attention.

Refinery and oil-field workers generally have the benefit of a safety engineer whose job it is to know what to do, but as all of us come in contact at some time with hydrocarbon vapors some general knowledge should be disseminated regarding their reactions on the body. For example, many persons find the odor of gasoline or benzene rather pleasant, not realizing that actual harm can result from too prolonged contact with either the vapors or the liquid.

This article gives a full summary of the known physiological reactions to hydrocarbons in general and includes the best facts available regarding the reactions of other compounds in frequent plant use.

PETROLEUM hydrocarbons from the lightest to the heaviest have certain effects which are characteristic from the physiological viewpoint. Anyone who has ever witnessed the so-called "hydrocarbon jag" will attest to this statement. Systematic studies have been made and certain specific recommendations have been forthcoming so that the after effects will be lessened as much as possible, and also preventive measures have been developed.

A number of hydrocarbons, particularly the gaseous ones, have been found excellent anesthetics, and application is made daily of such compounds as ethylene and cyclopropane in every hospital. Other hydrocarbons show these characteristics, but other factors limit their use. In many instances the anesthetic concentration and the fatal concentration lie too close together for any risk to be taken with human life; this should be forcefully impressed upon the worker who takes too much liberty with the inhalation of petroleum or gasoline vapors.

A number of tables have been prepared showing the effects of pure hydrocarbons on the human system. In addition others have been made which show the effect of mixtures such as gasoline, kerosene, etc. In studying the various processes such as catalytic cracking, alkylation, isomerization, dehydrogenation, and many others which are used throughout the modern refinery, other types of compounds, some organic in nature and some inorganic, have been cataloged to show their specific effect upon the body.

In some instances, especially in the

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TABLE 1—PARAFFIN AND OLEFIN SERIES, SUMMARY OF POSSIBLE PHYSIOLOGICAL EFFECTS

Compound—	Formula	Physiological effects of inhalation	Comments
Paraffin series:			
Methane	CH_4	87 per cent concentration in air—anesthetic.	In concentrations over 90 per cent asphyxiation occurs due to oxygen starvation.
Ethane	C_2H_6	4.7-5.5 per cent anesthetic when administered with oxygen.	Irregular respiration in guinea pigs was noted after 2 hours' exposure.
Propane	C_3H_8	90 per cent—produces human anesthesia.	60 per cent concentration with oxygen gives analgesia, lowers blood pressure.
Butane	C_4H_{10}	5.0-5.6 per cent—produces slight stupor in guinea pig; anesthetic to human in higher concentration.	No ill effects from remaining in atmospheres containing as high as 3-5 per cent for several hours (human).
Pentane	C_5H_{12}	Anesthetic and irritant; produces slight motor incoordination.	High concentrations arrest respiration.
Hexane	C_6H_{14}	Dizziness on exposure for 10 minutes.	5,000 p.p.m. depress respiration; high concentrations show tetanic convulsions.
Heptane	C_7H_{16}	Marked dizziness; emotional disturbances; muscle incoordination.	5,000 p.p.m. are toxic after 10 minutes exposure; tetanic convulsions are characteristic, individuals vary in sensitivity.
2-Methylhexane	C_7H_{16}	Less narcotic than normal compound.	Effects are toxic in higher concentrations.
Octane	C_8H_{18}	Anesthetic and irritant.	
2,5-Dimethylhexane	C_8H_{18}	Narcotic to mice.	Narcotic action only; too low in volatility to produce death.
Nonane	C_9H_{20}	Anesthetic and irritant.	
Decane	$C_{10}H_{22}$	Anesthetic and irritant.	
Olefin series:			
Ethylene	C_2H_4	Surgical anesthetic; 25-30 per cent concentrations are analgesic—has sweet taste.	950,000 p.p.m. fatal after 5-10-minute exposures; 800,000 p.p.m. toxic in ½ hour. In industry 61 per cent causes a variation in reaction time; 37.5 per cent shows a marked loss in memory after 15 minutes' exposure.
Propylene	C_3H_6	Anesthetic: 2¼ minutes inhalation causes intoxication, laziness, and inability to concentrate.	Toxic range for man is 65-70 per cent.
Butene-1	C_4H_8	Narcotic; produces muscle twitch.	20 per cent produces anesthesia; 4.5 times more potent than ethylene; higher concentrations are toxic; paralyze breathing.
Isobutylene	C_4H_8	Narcotic action les than for butene-1.	Used only on mice to determine effect.
Butene-2	C_4H_8	13-15.5 per cent produces deep narcosis in mice.	Some irritation in mucous tissues.
Pentene-1	C_5H_{10}	6 per cent concentration produces anesthesia with cramps in muscles like tetanic shock.	"Pental" trade name of anesthetic used in some hospitals. Anesthetic action 15 times that of ethylene. Dangerous to use, paralyzes breathing and heart.
Hexene-1	C_6H_{12}	More narcotic than pentene-1; also more toxic.	Used on mice only.
Heptene-1	C_7H_{14}	Narcotic to mice.	Used on mice only.

pure hydrocarbon group, the effects indicated are on mice and guinea pigs. The original experimenter chose these animals because their reactions more nearly paralleled those of man. There is also an attempt to tell the precise effects of these compounds in language readily understood outside the medical profession without loss or deviation from the original meaning.

The effects are generally those from inhalation, especially for the pure compounds. In mixtures where several hydrocarbons of varying groups are present, physiological effects are shown on contact with the skin and eyes. The pure hydrocarbons are, to a certain extent, an index of the effects in mixtures.

Table 1 summarizes possible effects of the paraffin and olefin series on the human body.

Effect of Other Hydrocarbons

Present-day gasolines contain other types of hydrocarbons in addition to the aliphatic group. Depending to a large extent upon the process used during manufacture, they may contain cyclic hydrocarbons such as cyclopentane and cyclohexane; if other hydrocarbons are used as blending agents to bring up the octane rating to aviation grade, benzene, toluene, xylenes, or cumene of the aromatic series may be added. To increase the volatility as well as the octane rating, isobutane and isopentane are also added to the mixture. Thus it is possible to have all the physiological effects ranging from those of the light hydrocarbons of the aliphatic series to the more serious delayed and cumulative action of the aromatic group present in one gasoline.

Table 2 shows the possible effect of diolefins which may be present and also the alicyclic group. Again it should be noted that the lower members are not actually present in the finished gasoline but may be encountered during processing with the exception of the cyclopropane and cyclobutane groups which must be synthesized by special reactions. However, these are included as they show the typical effect without the overwhelming toxicity factor present in the others.

The petroleum industry has only recently produced aromatic hydrocarbons on a large scale. Until the war demanded continually increasing amounts of benzene, toluene, xylenes, ethyl benzene, and cumene, the production of these compounds was generally conceded to the coal-tar industry where the major portion has always been derived. Some crude oils, such as those from Borneo and California, have a high aromatic content. Both benzene and toluene were separated from them during the first World War to supplement the amounts derived from the coal-tar industries and were used for the preparation of explosives as well as for gasoline blending purposes. The greater portion of aromatics needed by the petroleum industry and its allied groups during the second World War were produced catalytically as sufficient amounts could not be obtained from any other source.

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Roy G. Benson was associated with Universal Oil Products Co. for 17 years, before establishing his own safety - engineering company in 1945. He has had wide experience in this work, and has made important contributions toward accident prevention through the development of specially designed equipment. He is the author of a number of instructive and informative articles on safety precautions necessary in the petroleum industry.

Miss P. M. Van Arsdell graduated from Indiana University in 1935 with an M. A. degree in chemistry and a minor in physiology. Before joining Benson as a partner in Benson & Associates, Chicago, she was associated with Universal Oil Products Co. for 10 years, first as an assistant to Dr. Gustav Egloff, and later as the head of the technical education department. She is the author of a number of articles on petroleum technology.

As a result of the increasing octane ratings required for aviation fuels, processes which could produce aromatics were necessarily installed. The catalytic nonselective polymerization process was converted for the

TABLE 2—DIOLEFIN AND CYCLOPARAFFIN SERIES, SUMMARY OF POSSIBLE PHYSIOLOGICAL EFFECTS

Compound—	Formula	Physiological effects of inhalation	Comments
Diolefin series:			
Propadiene	C_3H_4	Anesthetic action twice that of propene.	
Butadiene	C_4H_6	Narcotic action; 1 per cent concentration causes quick pulse.	Prickling dryness in nose and throat. Concentrations up to 140 mg. per liter causes irritation of lungs and spleen; bone marrow is also affected.
2-Methylbutadiene-1,2	C_5H_8	Narcotic effect in mice.	Small concentrations produce sleep in mice.
Isoprene (2-methylbutadiene-1,3)	C_5H_8	Some narcotic effect.	Irritation of nose and respiratory organs; disintegration of blood cells in spleen—anemia on long contact.
Cycloparaffin series:			
Cyclopropane	C_3H_6	Clinical anesthetic.	Six times more potent than ethylene—no postoperative effect.
Methylcyclopropane	C_4H_8	Narcotic with a persistent knee-jerk present.	Irregular heart action, fall in blood pressure.
1,2-Dimethylcyclopropane	C_5H_{10}	9 per cent in air causes anesthesia in rats.	Same action as methylcyclopropane; recovery good after 2 minutes.
Trimethylcyclopropane	C_6H_{12}	5-6 per cent anesthetic in action; 5.2-17 per cent sufficient for surgical anesthesia in rats.	Has marked effect on respiration which stops before heart action.
Cyclobutane	C_4H_8	No clinical studies recorded in literature.	
Cyclopentane	C_5H_{10}	Narcotic and fatal (mice and rats).	The minimum narcotic dose is also fatal. No safe margin.
Methylcyclopentane	C_6H_{12}	Narcotic and fatal (mice and rats).	Minimum narcotic dose—fatal; convulsion precedes death.
Ethylcyclopentane	C_7H_{14}	Narcotic and fatal (mice and rats).	Minimum narcotic dose—fatal; deep anesthesia precedes death.
Propylcyclopentane	C_8H_{16}	Some narcotic action and loss of reflexes (mice).	Fatal concentration greater than that for narcotic action.
Cyclohexane	C_6H_{12}	Narcotic action; staggering and paralysis (human).	Has some blood-destroying action; fatal concentration, 60-70 mg. per liter of air.
Methylcyclohexane	C_7H_{14}	Narcotic and fatal (mice and rats).	No great margin between narcotic and fatal concentrations.
Dimethylcyclohexane	C_8H_{16}	Narcotic and fatal (mice and rats).	No great margin between narcotics and fatal concentrations.

production of cumene. Dehydrocyclization and other methods were used to produce toluene from heptanes. Other catalytic processes made benzene, xylenes, and ethyl benzene. Cumene was used as a valuable blending agent for 100-octane aviation fuel; toluene for TNT and blending; benzene and xylenes for blending; and ethyl benzene was the starting compound for production of styrene for synthetic-rubber manufacture.

The aromatic compounds boiling in the gasoline range all have a distinctively toxic action on the body. Their effects are decidedly more toxic than any of the aliphatic or alicyclic groups.

They have both blood and nerve-destroying action when inhaled in great quantities or over extended periods. The skin readily absorbs these compounds making it necessary to use great care when the compounds are present as liquids. Because the aromatics have been studied in connection with the coal-tar industries over an extended period, clinical reactions are quite well known for some of the members, and safety and first-aid precautions have received much attention.

Frequent examinations including blood tests and urinalysis should be made of all persons working in the presence of aromatic compounds. Protection from inhalation should be provided by chemical respirators; for the body, rubber hats, suits, gloves, and boots should be worn. Places of contact are tanks being cleaned, and inhalation may occur when vessel or line leaks take place. Benzene has a specific and severe action on blood while the other members of the series have more specific actions on nerves and less on blood.

Table 3 shows a digest of the possible physiological effects of certain of the lower members of the aromatic series.

It is seldom that any single compound, with the exception of benzene, is used alone. For that reason the effect of mixtures on the body reaction is more important than that of individual compounds. The single compounds are an index to a limited

"Zoot suit" for use where corrosive vapors or gases are present. (Courtesy U. S. Rubber Co.)

extent of what effect inhalation or contact with a mixture will produce. Table 4 shows petroleum fractions and the hydrocarbons contained therein. In addition it must also be realized that gasoline which is now used for motor fuel contains, besides the gasoline-fraction hydrocarbons, additives such as light hydrocarbons, isobutane and isopentane which enhance volatility, benzene, phenolic-type compounds used as inhibitors to prevent deterioration on storage, and tetraethyl lead.

As over half the gasolines used today are made by means of cracking processes, branched chain paraffins, various olefins and other types of hydrocarbons are also present. Certain possible characteristic body reactions are tabulated below for both paraffinic and olefinic types:

1. Aliphatic hydrocarbons - narcotic effects increase with the length of straight chains up to C_8.

2. Straight chain hydrocarbons are more toxic than isomers.

3. Toxicity increases as solubility in oil increases.

4. Irritant action increases with molecular weight.

5. Tetanic convulsions increase with molecular weight.

6. The skin-irritant action increases as the number of carbons increase from C_5 to C_{12}. There is no lasting action of irritation, some redness which persists for a time appears, and the hydrocarbons give a burning sensation during contact.

When aromatic hydrocarbons are present they add toxic and cumulative effects to the gasolines.

Contacts with gasolines are most frequently made when it is necessary to clean storage tanks, and when gasoline leaks from storage tanks or pumping machinery, or when accidental spillage occurs in underground pipe rooms of dispensing or storage depots. Particularly in the latter are toxic concentrations present.

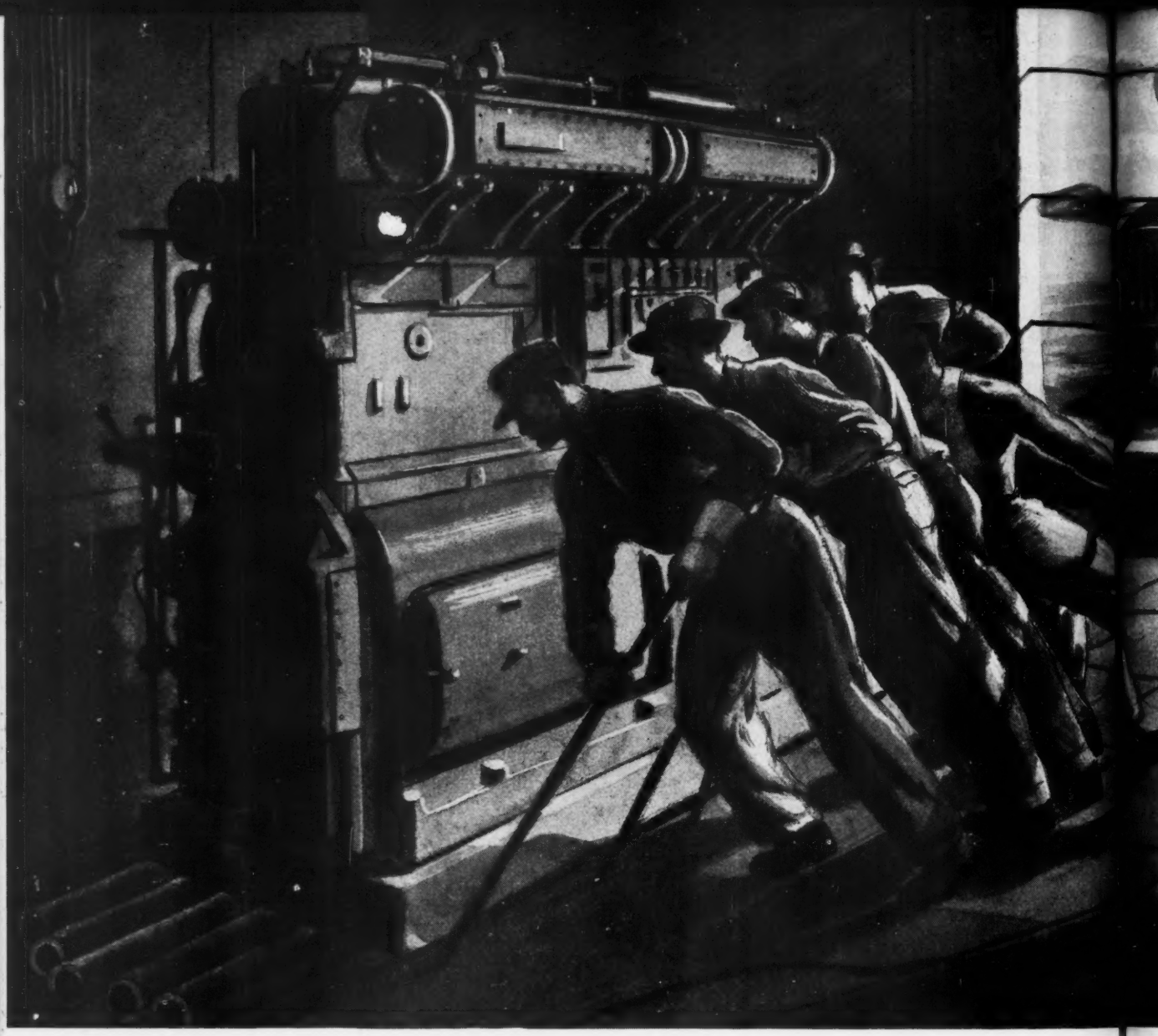
(Continued on page 100)

TABLE 4—HYDROCARBON CONSTITUENTS OF LIGHTER PETROLEUM PRODUCTS

Compound	B. P. °C.	Main constituents
Petroleum ether	20°-60°	C_5H_{10}, C_5H_{12}, and C_6H_{14}
Petroleum benzine	40°-90°	C_5H_{12}, C_6H_{14}, and C_7H_{16}
Naphtha	65°-120°	C_6H_{14}, C_7H_{16}, C_8H_{18}
Benzine	110°-150°	C_8H_{18} — C_9H_{20}
Gasoline	10% below 65°) 90% below 200°)	C_5H_{12}, C_6H_{14}, C_7H_{16}, C_8H_{18}, C_9H_{20}, $C_{10}H_{22}$, and some higher homologs.

TABLE 3—SOME OF THE AROMATIC SERIES, SUMMARY OF POSSIBLE PHYSIOLOGICAL EFFECTS

Compound	Formula	Physiological effects of inhalation	Ingestion	Skin	Systemic
Benzene	C_6H_6	Faintness, dizziness, visual disturbances, rapid pulse, blue color in lips, narcosis and convulsions.	Acute toxic digestive upset	Easily absorbed; very toxic.	Nausea and vomiting accompanied in later stages by reduction in both red and white blood cells, and extensive nerve damage.
Toluene	C_7H_8	Less volatile, but inhalation produces same symptoms as benzene.	Same as benzene	Same as benzene	Same as benzene
o, m, and p-xylenes	C_8H_{10}	Same as benzene, but less volatile.	Same as benzene	Same as benzene	Same as benzene
Ethylbenzene	C_8H_{10}	Unconscious; jerky then shallow respiration. Locally anesthetic for sense of smell.		Irritates mucous membranes	Somewhat less toxic than benzene.
Cumene	C_9H_{12}	No clinical data—except for the volatility the compound should react much the same as ethyl-benzene.			



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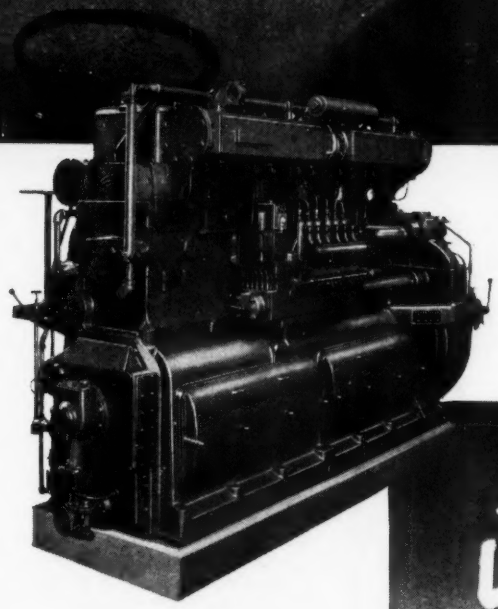

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TABLE 6—CATALYTIC REFINING PROCESSES; A SUMMARY OF POSSIBLE PHYSIOLOGICAL EFFECTS OF THE CATALYSTS

Process—	Catalyst	Physiological effect of inhalation	Ingestion	Eyes	Skin	Systemic effect	Protective equipment	First aid
Cycloversion	Naturay clay	Mechanical irritation to nose and throat	None	Irritation as from sand	Dermatitis from drying	Silicosis might develop over a long exposure	Dust respirators, goggles, and protective cream for hands and arms.	Mild salt solution for washing eyes; follow with a 5 per cent argyrol; if dermatitis is severe—use heavy antiseptic cream.
Fluid catalytic cracking	Alumina-silica	Same as natural	None	Irritation as from sand	Same	Same	Same	Same
	NH_3 to precipitate	Irritating caustic effect	None	Conjunctivitis	Acute caustic burn	Acute inflammation of respiratory organs	Gas masks or chemical hood with outside air supply.	Remove persons to fresh air; administer oxygen in case of collapse, and artificial respiration.
Houdry catalytic cracking	Aluminum hydrosilicate; Molten KNO_3 and $NaNO_3$	Mechanical irritation	None	Irritation as from sand	Dermatitis from drying Burns from splattering	Dust might cause silicosis on prolonged contact, deep burns	Goggles, dust respirators, protective cream for hands and arms. Asbestos clothing.	Salt solution for eye wash followed by 5 per cent argyrol.
Suspensoid	Finely powdered natural or synthetic clay	Same	None	Irritation as from sand	Dermatitis from drying	Silicosis might develop	Respirators, goggles, protective cream for hands and arms.	Same as above
Thermofor	Solid clay	If dust is present, mechanical irritation	None	Same	Same	Same	Same	Same
Hydroforming	Chrome-alumina	Nose bleed			Chrome ulcers		Respirators, goggles, protective cream.	Thorough washing followed by a bland salve.
HF alkylation	Hydrogen fluoride	A single lungful causes death	Gastric destruction	Chemical burn	Delayed action burns from low concentrations	Acute nephritis and fluorosis	Air supplied neoprene suit, helmet, and boots, neoprene gloves.	For eyes, immediate flushing with water, for burns, magnesium oxide salve, and if necessary, calcium gluconate injections.
Alkylation	Sulfuric acid	Lung irritant	Gastric upset	Chemical burn	Chemical burn		Rubber clothing including rubber gloves, suit, and boots, goggles.	For splashes, immediate washing with plenty of water.
Isomerization; isomate	Aluminum chloride, hydrogen-chloride, antimony Cl_3	Irritating to nose and throat, corrosive action in nose and throat, irritating	Poisonous and corrosive, poisonous	Very irritating, acid burn, irritating	Dehydrating action, chemical burn, dehydrating		Goggles, chemical respirators, and rubber clothing, boots, gloves.	Skin contacts should be wiped dry and then water applied. Flushing with plenty of water, bicarbonate of soda for neutralizing.
Polymerization	"Solid" phosphoric acid	Lung irritant and also mechanical irritation		Irritating from dust	Drying—dermatitis		Goggles, chemical respirators, protective cream.	For eyes, mild salt solution followed by 5 per cent argyrol.
Hot acid polymerization	Sulfuric acid	Lung irritant	Gastric upset	Chemical burn	Chemical burn		Rubber clothing, including rubber gloves, suit, and boots, goggles for eyes.	For splashes, immediate washing with plenty of water.
Dehydrogenation	Chrome oxide and alumina	Nose bleed		Irritating	Chrome ulcers		Respirators, goggles, gloves, protective cream.	Thorough washing, followed by bland antiseptic salve.

Where certain fractions of petroleum have been used as a paint carrier substituting for turpentine or other quick-drying vegetable oils, it is possible for concentrations especially in enclosed areas to become fatally toxic. Care must be taken at all times to provide sufficient ventilation to prevent such accidents.

Perhaps the most startling, especially for an observer, of all manifestations of hydrocarbon effects on the body is the previously mentioned "hydrocarbon jag." It has all the effects of a good drunk. Singing, laughing, muscular coordination are all uncontrollable and in certain instances the victim looks much like an epileptic fit has seized him. There is dizziness and considerable excitement. Recovery, however, is speedy when the person is removed to open air. Prolonged breathing of concentrated amounts of mixtures of hydrocarbons may cause death with no other warning than a slight headache, nausea, and some loss of muscular control. Sometimes anesthesia is quickly followed by death if the person is not removed to fresh air. Generally, with the exception of the aromatic hydrocarbons, there are no after effects even when high concentrations are inhaled; recovery is immediate when the person is removed to open air.

Effects of Other Substances

Crude petroleum as it comes from the well contains a number of impurities such as sulfur, nitrogen, and traces of metals. From a physiological standpoint sulfur is the most important contaminent, as hydrogen sulfide (H_2S) is nearly always present when crudes are refined. Hydrogen sulfide gives rise to the familiar "rotten egg" odor so common in refining areas. As H_2S is normally gaseous, the physiological effects are caused by inhalation and absorption by the exposed mucous tissue of the eyes and nose. Inhalation is the most

TABLE 5—TOXICITY TABLE FOR HYDROGEN SULFIDE

Concentration in air (p.p.m.)	Effects
* 50	Irritation of eyes and respiratory tract and perhaps some evidence of subacute poisoning on daily contact.
100	Local irritation to eyes and respiratory tract after exposure for 1 hour.
200	Dangerous if inhaled for 1 hour. Severe irritation of eyes and respiratory tract. Eyes react in 6 to 8 minutes.
500	Dangerous for 15 to 30 minutes. Severe irritation of eyes and respiratory tract. Eyes show same effect as welder's flash burn. Pneumonia or serious lung irritation may prove fatal.
600	Immediate collapse, acute poisoning, suspension of breathing, heart failure, and death.
800	Same as for 600.

(Continued on page 103)

TABLE 7—TREATING PROCESSES, SUMMARY OF POSSIBLE PHYSIOLOGICAL EFFECTS

Process—	Treating agent	Physiological effects of inhalation	Ingestion	Skin contact	Eyes	Systemic	Protective equipment	First aid
Sulfuric acid treating	Sulfuric acid	Lung irritant	Gastric upset	Chemical burns	Chemical burn	None	Rubber clothing including rubber gloves, suit, and boots, gogles for eye protection.	For splashes — immediate washing with plenty of water, follow with lime water: for ingestion — magnesium or alkali carbonates, soap or oil, albumin or ice.
Lead sulfide sweetening	Lead sulfide	Enters body by inhalation but no effect on lungs	Lead colic		No effect	Lead poisoning, cumulative from long contact. Lead colic and wrist drop	Rubber gloves, respirator, and goggles.	Swallowing — emetics, stomach pump, sodium, potassium, or magnesium, sulfates, milk, or albumin.
Thylox	Sodium-thio-arsenate	Irritant to deep lung tissues, pierces nasal septum	Poisonous	Darkening, excema on mouth and lose, loss of nails and hair		Cumulative	Respirators and goggles.	On ingestion; milk, raw egg, sweet oil, lime water, or flour and water.
Shell phosphate desulfurization	Tripotassium phosphate	Irritant when droplets are inhaled		Caustic burns	Caustic burns		Dust respirator, goggles, and rubber gloves.	Treat same as caustic.
Gray Clay treating	Clay or fuller earth	Mechanical irritation from dust		Dermatitis from drying	Irritant	Chance of silicosis on prolonged contact	Respirators, goggles, and protective cream	Thorough washing, and soothing antiseptic cream. For eyes—salt solution followed by argyrol 5 per cent.
Unisol	Caustic	Choking, damage to upper respiratory tract	Poison	Burn from drying	Burning — blindness after 5 min.		Goggles, respirators, rubber gloves, rubber clothing and boots	For eyes — immediate washing; skin-wash, neutralize, and follow with mild vinegar.
	Methanol	Blindness from inhalation	Poisoning, death	Absorption to system	Blindness	Cumulative, causing vomiting, blindness and death	Goggles, respirators, rubber gloves for ordinary work.	Swallowing—emetic or stomach wash using pump and solution of 10 grains of sodium citrate/oz H_2O milk, doses of Epsom salts, white of eggs and milk.
Furfural solvent extraction	Furfuraldehyde	None		None	None	None	None	
Phenol solvent extraction	Concentrated phenol	Irritant	Violent poison, corrosive to organs	Burning with anesthetic effect (much damage can be done because of this)		Degeneration of blood, emaciation, nephritis, gangrene and jaundice	Goggles, chemical respirator, rubber gloves, rubber suits, and boots.	For ingestion—zinc sulfate as emetic or uncooked egg white in abundance, olive or castor oil with magnesium oxide in suspension, ice wash stomach with water and vinegar; alcohol or whiskey or camphorated oil 4 oz/time.
Duo-Sol (Propane and Selecto)	Propane	Anesthetic				See phenol	See phenol	See phenol
	Phenol and Cresol	Same as concentrated phenol	Same as conc. phenol	Same as phenol				
Phenolate	Sodium phenolate	Less dangerous than concentrated phenol	Same as phenol	Same as phenol	Same as phenol	See phenol	See phenol	See phenol
Solutizer	Potassium salts of weakly acid phenols	Less dangerous than phenol	Same as phenol	Same as phenol	Same as phenol	See phenol	See phenol	See phenol
Tannin solutizer	Alkyl phenols and / or isobutyric acid	Same as above Slightly irritating, offensive odor	Gastric upset	Same Slightly irritating	Same	See phenol	See phenol Protective cream for isobutyric acid	See phenol Emetic, magnesia, chalk, soap and oil
Edeleanu extraction process	Liquid sulfur dioxide	Irritating — long exposure produces catarrh		Irritating — acid forms on mucous tissues	Very irritating	Exclusively affects respiratory tract	Respirator and goggles	Remove person to fresh air, artificial respiration and oxygen.
Gasoline gum inhibitors	Phenollic type compounds, aromatic amines	Same as phenols Poisoning	Same as phenols	Same as phenols, Absorbed causing systemic poison	Same as phenols	Same as phenols Cyanosis. weakness, irritability, confusion	Same as phenols Goggles, chemical respirators, rubber gloves, suits and boots.	Same as phenols For spills: remove clothing immediately and wash area with soap and water. Do not wear clothing again.
Copper sweetening	Copper chloride or copper bromide	None	Gastric upset	No absorption		Toxicity is low; absorption limited		For splashes—wash area thoroughly.

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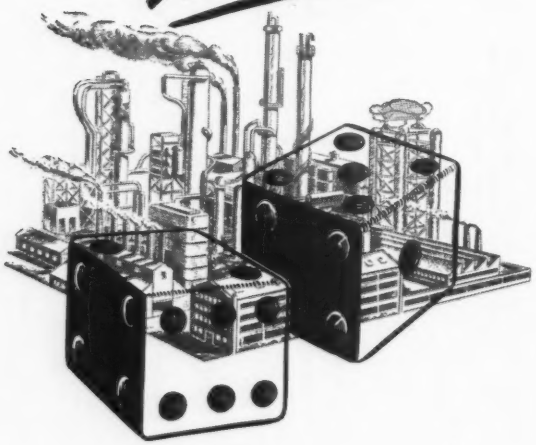

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This activated bauxite desiccant is successfully drying hydro-carbon gases and liquids, liquid organic chemicals, electrical oils, hydrogen and compressed air. These installations involve wide pressure, temperature, and moisture ranges. In most cases, Driocel meets these conditions with superior performance and long life. And, the fact that Driocel's price is substantially lower than other well known solid desiccants is noteworthy.

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TABLE 8—PHYSIOLOGICAL EFFECTS OF VARIOUS ADDITIVES

Additive—	Physiological effect of inhalation	Ingestion	Skin	Eyes	Systemic	Protective equipment	First aid
Tetraethyl lead	Absorbed by body	Highly toxic death ensues if small amounts are ingested	Absorbed by skin and highly toxic		Early signs, insomnia, nausea, vomiting, loss in weight, low blood pressure.	White clothing, gloves, boots, goggles, respirators. Kept in separate lockers from other clothing.	
Ethyl alcohol	Dizziness, signs of intoxication	Intoxication, in quantity, if denatured, illness ensues	No absorption, some drying	Irritating	Drunkenness	For mixing—gloves should be worn.	Black coffee or administration of caffeine by a physician.
Methyl alcohol	Blindness from inhalation, action is cumulative	Poison—blindness and death	Absorption to system	Blindness from absorption	Cumulative poison causing pain, vomiting and death.	In mixing—gloves, respirators, and goggles—aprons, and boots should be worn.	Emetic or stomach wash using pump and solution of sodium citrate. Milk, white of egg, and purgative doses of Epsom salts.
Diesel: Ethyl nitrite	Dry cough, shortness of breath, death from pulmonary edema in a few days				Shortness of breath, pulmonary edema, heart stimulant.	Goggles and respirators (chemical).	Call physician immediately, inhalation—horizontal position, head lower than body, stimulants, oxygen if necessary: ingestion-emetic of apomorphine-hydrochloride, stomach tube.

dangerous, and the toxicity is of two classifications, subacute and acute.

Subacute or acute poisoning is a function of the concentration of H_2S in the atmosphere. Severity of the subacute symptoms increases in direct ratio with concentration. Concentrations as low as 0.005 per cent are toxic and cause irritation of the eyes and respiratory tract. As the concentrations increase, the effects are more intense and there is a shorter length of time elapsing before symptoms of severe poisoning are evident. Table 5 shows H_2S concentrations in the atmosphere and their physiological effects. Although H_2S is easily detectable, when concentrations are from 100 to 150 p.p.m. the sense of smell is paralyzed in 2 to 15 minutes, and continued exposure brings on collapse. According to the American Standards Association recommendations only 20 p.p.m. are allowable for daily contact. It has, however, been strongly recommended by other authorities that this figure be lowered to 10 p.p.m.

Generally there is no definite clinical procedure for the treatment of acute cases of H_2S poisoning. For subacute cases the treatment depends upon the amounts inhaled or contacted. For conjunctivitis from H_2S, boric acid solution should be used to irrigate the eye area and this treatment followed by 10 per cent argyrol.

When the effects of eye contact are more pronounced as in 500 to 600-p.p.pm. concentrations of H_2S contact, vaseline, neutral petrolatum, or boric acid ointment should be applied to the eyelids, and when the pain is acute ice packs are beneficial when applied for 15-minute intervals three times per day. Early use of dark glasses relieves eye strain.

For pharyngitis, silver nitrate in 10 per cent concentration or argyrol may be used as well as an oily spray to relieve some of the scratchy soreness. When bronchitis develops as an aftermath of exposure an expectorant should be used; when fever develops the patient should be confined to bed and a physician's advice strictly followed.

First aid in the form of respiratory stimulants and artificial respiration should be given immediately when an overcome person is removed from H_2S fumes. An oxygen inhalator should also be used.

In the past 10 years many new processes have been developed for the production of high-octane-number gasoline and other products. These processes are catalytic in nature and the compounds used in this capacity are many and varied. To summarize the clinical findings and experiences with these various products Table 6 has been prepared showing the processes, the catalysts, their chief physiological effects, and protective and first-aid measures which should be followed.

Gasoline Treating

Gasoline treating has a number of functions. Depending upon the source of the petroleum used in gasoline production, compounds are used for treating which will remove tar-forming substances, mercaptans, or other undesirable impurities which lower its value as a motor fuel. Certain types of substances are also used to insure good storage properties. Many agents and processes are presently on the market which perform these functions. Chemical characteristics of the treating compounds vary considerably as many types of compounds are used ranging from a practically inert clay through arsenic compounds and concentrated phenols. As a consequence the physiological reactions are just as diverse. Table 7 gives a summary of the treating processes and compounds used, together with their physiological effects, protective measures, and first-aid treatment.

In addition to treating or processing to enhance or preserve the quality of refined products, other methods are used to bring up the fuel ratings. Table 8 shows the physiological effects of the various additive agents now used.

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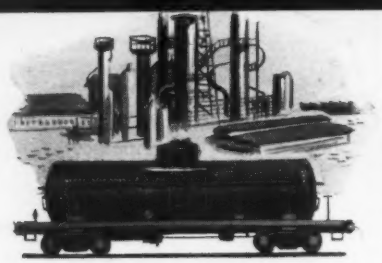
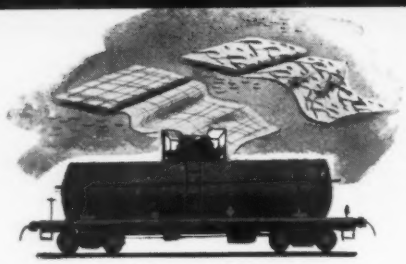


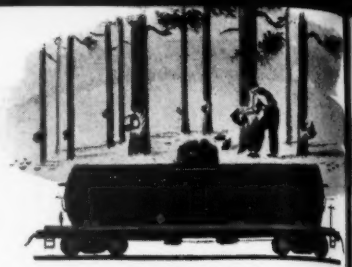
ALCOHOL

Clean, steel car, 6,000 to 10,000 gallon capacity.



CAUSTIC SODA

Heavily insulated steel car, with or without heater coils, 8,000 or 10,000 gallon capacity. Usually specially lined.

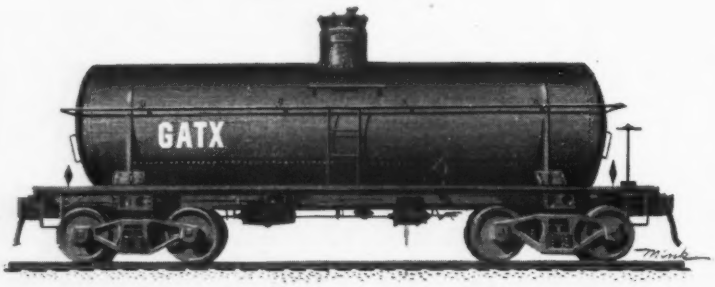


TURPENTINE

Clean steel car; 6,000 to 8,000 gallon capacity

FOR RENT

TANK CARS



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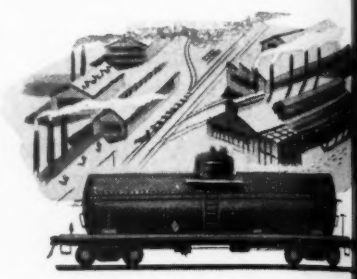
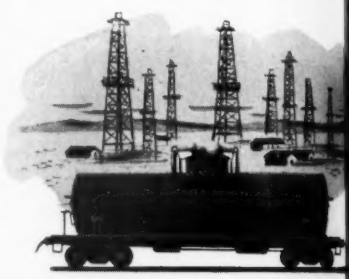


FUEL OIL

Steel car, steam coiled, 8,000 to 12,500 gallon capacity.

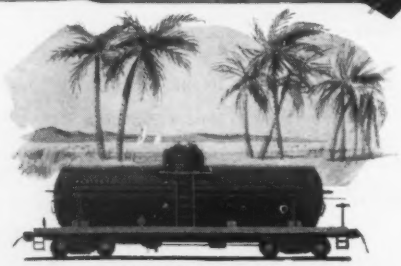


MURIATIC ACID

Car lined with pure or synthetic rubber; 8,000 to 10,000 gallon capacity.

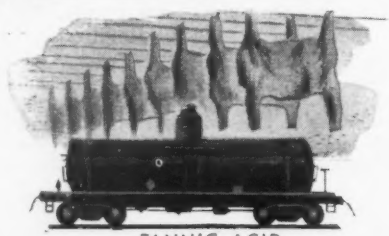
GASOLINE

Clean car, 6,000 to 12,500 gallons; single or multiple compartment



COCONUT OIL

Clean steel car, with steam coils, usually 8,000 gallon capacity

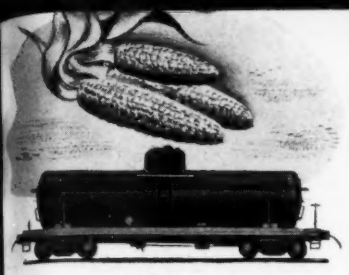


TANNIC ACID

Equipped with brass coils and interior lined with a resinous, plastic or asphaltic material

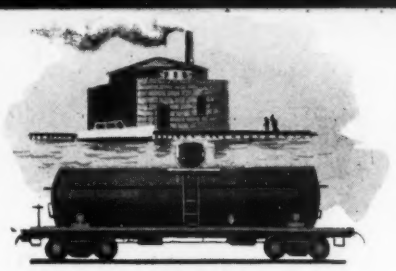
MOLASSES

Steam coiled car with heavy capacity trucks; 8,000 gallon capacity



CORN OIL

Clean, steam coiled car.

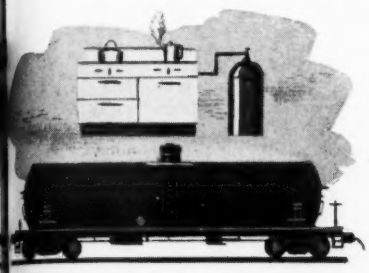


CHLORINE

Insulated, welded car; built to withstand pressure up to 500 pounds; 15 or 30 ton capacity.

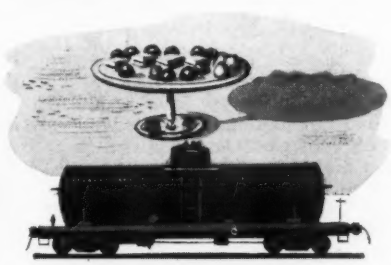
COTTONSEED OIL

Clean, steam coiled car of 8,000 gallon capacity.



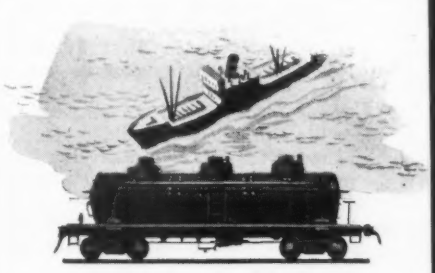
PROPANE

ily constructed car, welded and insulated. l to withstand internal pressures to 300 pounds. Capacity 10,000 to 11,000 gallons.



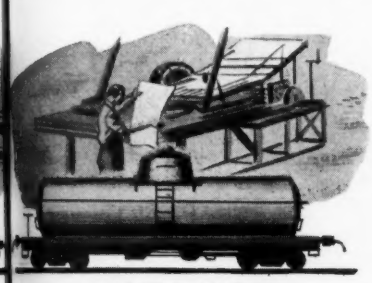
CORN SYRUP UNMIXED

Clean, steam coiled with heavy truck capacity. Usually lined with aluminum paint.



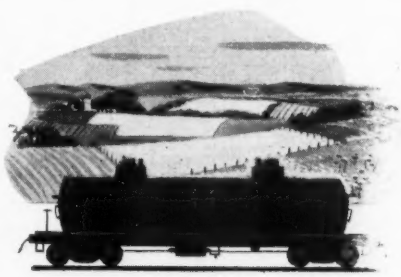
LUBRICATING OIL

Steel car, with steam coils, single or multiple compartment; usually 8,000 gallon capacity.



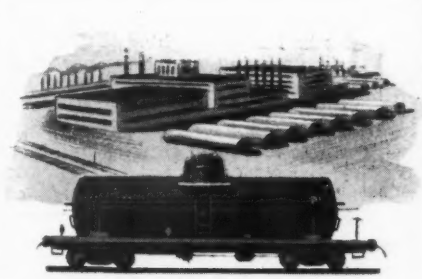
ACETIC ACID

inum Car, 8,000 or 10,000 gallon capacity.



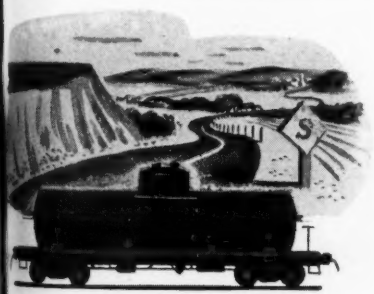
LINSEED OIL

Steel car equipped with steam coils; single or multiple compartment, usually 8,000 gallon capacity.



BENZOL

Clean car, with steam coils; 8,000 to 12,500 gallon capacity.

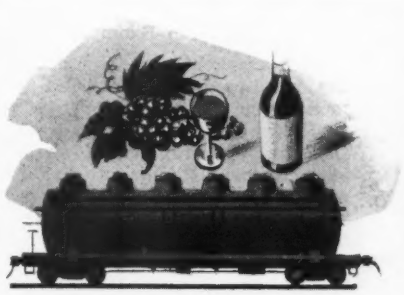


ASPHALT OR TAR

ily steam coiled car; with 2 or more inches of lation; steam jacketed outlet; 8,000 to 10,000 gallon capacity.

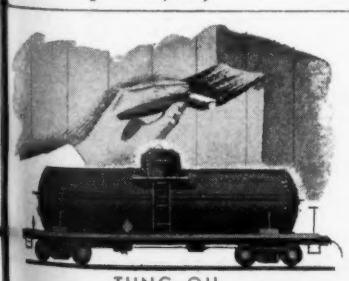
LARD

Clean steam coiled car, usually of 8,000 gallon capacity



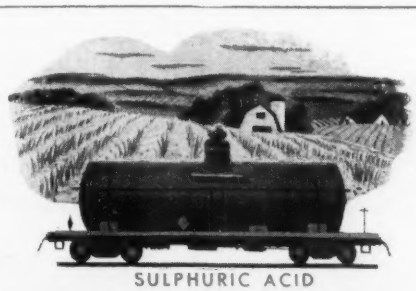
WINE

Insulated car with one to six compartments. Interior coated to preserve quality.



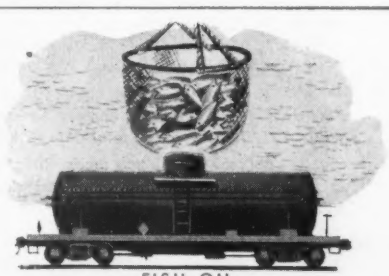
TUNG OIL

n coiled steel car, usually of 8,000 gallon



SULPHURIC ACID

Heavily constructed steel car with heavy truck



FISH OIL

Steel car with steam coils.

DRILLING TIME REDUCED

. . . in Permian Basin, by closer study of practices and use of new equipment

by George Weber

DURING the past 2 years, remarkable progress has been made in reducing the drilling time on medium and deep wells in West Texas and New Mexico. Many factors contributed to this trend, one of the most important being a closer study of drilling practices and their effect on penetration rates through hard formations. Drilling contractors are responsible for the great share of this work, in which they had close cooperation of many oil company engineers.

The area has continued to lead the country in active drilling operations over the past several years, due in part to new development of pre-Permian reserves. This volume of active operations plus the difficulties in drilling hard formations to greater depths has spot-lighted the area as a prime proving ground for new equipment and practices.

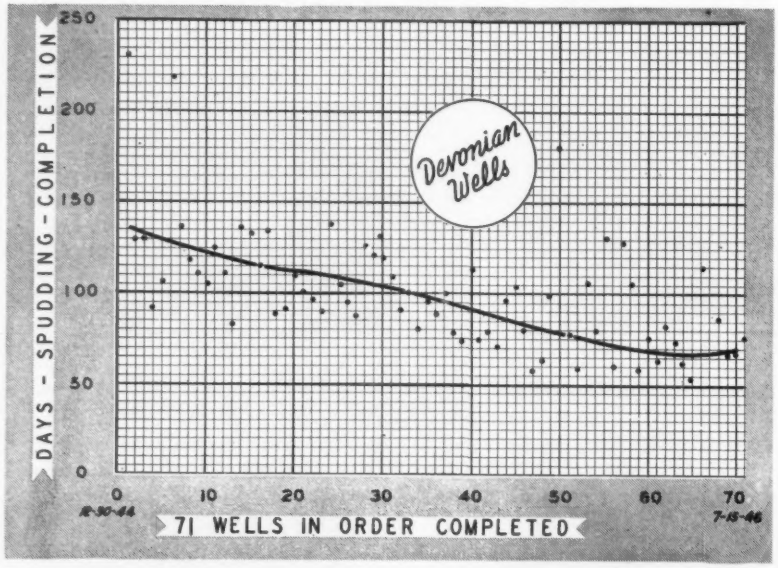
The Permian Basin is contractors' country. Of a total of 353 rotary rigs located in the area in July, 92 per cent were owned by 120 drilling contractors. The remaining 8 per cent were operated by nine oil companies. Development of new reserves below the Permian horizon has accounted for a gradual increase in average total depth of wells in proven and wildcat locations. At the present time about 35 active tests are projected to the Devonian formation and 95 are drilling for Ellenburger pay.

TXL An Example

With an average of 37 active drilling operations throughout the past 6 months, the TXL field of Ector County, Texas has led other pre-Permian fields in volume of development this year. Although drilling to the Devonian and Ellenburger producing formations is easier at TXL than in many other similar fields, the volume of completions during the past 18 months provides a fair index of drilling progress in a particular field. Thus, while actual completion times at TXL may be longer than in other pre-Permian fields, the time trend may be considered representative of the area in general.

Figs. 1 and 2 illustrate this drilling progress, based on the 105 wells completed by early July 1946 in the two principal producing horizons. Plotted are the days elapsed from spudding to final completion, on each well in the chronological order in which it was completed. All are single completions, although some wells completed in the Devonian formation were first drilled to the deeper Ellenburger and later plugged back.

For Devonian wells, the estimated trend curve indicates a reduction of about 35 per cent in over-all completion time. Ellenburger wells during the period beginning in early summer of 1946 reflect a reduction of about 40 per cent in completion time. Both curves show a tendency to level off at the end of the period covered, bearing out the general feeling among drilling contractors that reductions in drilling time may be approaching a limit, at least for the next several months. This approach to record time



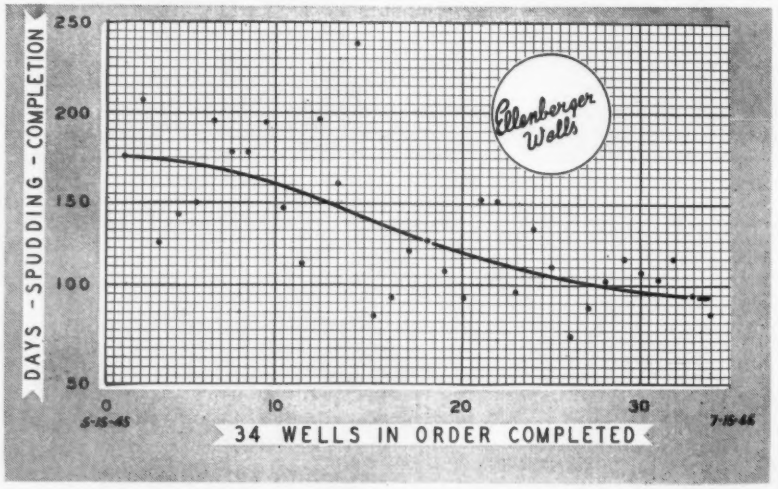


Fig. 1—(Top) Completion times, Devonian wells, TXL field. Average total depth 7,900 ft.

Fig. 2—(Bottom) Completion times, Ellenburger wells. TXL field. Average total depth, 9,750 ft.

in each formation is illustrated by the fact that record wells in each case are not the most recent ones.

Part of the increase in over-all penetration rates must be credited to the normal increase in subsurface information, necessitating less coring and testing as the field progresses. The accumulation of formation data and experience in an area gives the contractor a steadily clearer picture of what to expect and what time-saving practices can and cannot be used. The amount of chert and other hard formations varies throughout the field, and on the average the same over-all conditions of difficult drilling were encountered during the 18-month period charted.

A more direct comparison of drilling times is shown in Fig. 3; drilling time charts of four selected Ellenburger wells in the TXL field, drilled in the order numbered at 2 to 4-month intervals. Casing programs, while not identical, are substantially the same, as are total depths and pay tops. On all wells casing was set at or near the top of the Ellenburger and wells were drilled into the formation for completion. Although the amount of chert encountered in these wells varied, the improvement in drilling time is attributed by the operator to improved technique in cutting time. The last well held the field record in July, and the four examples do not necessarily represent averages of all wells for their respective periods, but highlight the drilling progress made.

Drilling Time Factors

A consensus among contractors and field engineers credits the marked reduction in drilling time in the Permian Basin to many factors. Among those most commonly cited are:

1. Use of longer intermediate casing strings.
2. Partial substitution of clear water for drilling mud.
3. Increased weight applied to bit.
4. Increased efficiency of drilling crews.
5. Improved drilling equipment.
6. More prompt and efficient service.
7. Increased knowledge of subsurface conditions.
8. Trend toward drilling slimmer holes.
9. Better control of corrosion and other causes of drill pipe failures.

The practice of setting intermediate casing through the salt sections to depths of from 3,500 to 4,000 ft. provides more rapid penetration principally by allowing the safer use of water as a drilling fluid. First adopted generally at Fullerton, the casing program is becoming almost universal in the area. By sealing off the main salt section and underlying stringers, the driller can continue down the hole without the need for starchy, low water loss muds. The additional cost of casing is partilly offset by savings in mud costs. Regardless of such savings, the longer intermediate string is considered worth the added expense in eliminating the difficulties and hazards of drilling with exposed salt sections, although the direct bearing of such safety on drilling speed is not measurable.

Use of water as a drilling fluid, on the other hand, does greatly improve drilling time, as shown graphically by Warren and Schabarum[1] whose studies at Fullerton show a reduction of drilling days, rotating hours and bits used, directly resulting from a substitution of water for mud. The main action of water appears to be its good hydrating effect. In washing gypsum and anhydrite deposits from between bit teeth, it allows greater tooth penetration into hard formation.

In some cases, particularly on the flanks of the Permian belt, where greater thickness of black shale is encountered, water may not safely be substituted for mud. In such locations, mud with viscosity of 36-38 sec., weight of about 9.4 lb. and water loss characteristics of 12-16 cc. is necessary to penetrate the caving shale sections safely. In extreme cases, viscosities up to 45 sec. are used, with water loss ranging from 3 to 2 cc.

In the majority of locations, however, where hole enlargement is not a threat and extreme subsurface pressures are not present, water is substituted for mud in drilling from the seat of the surface casing to within a few hundred feet of the producing horizons. Common practice in some pre-Permian fields is to mud up about 200 ft. above the base of the Permian formation, to assure recovery of larger cuttings in markers below that depth. Mud is then continued in use to completion. In cases where Permian horizons offer production possibilities, mud is employed in penetrating them.

The slower rate at which water returns cuttings results in their emerging at the surface finely ground by action of the drill string in the annulus, thus water is inferior to mud in picking markers from samples. An annular flow of water of at least 2 ft. per second is considered necessary to carry cuttings safely to the surface, and most contractors maintain the rate well above that minimum. Although widely used, not all contractors advocate water's use without qualification. It is blamed by one contractor for a bad fishing job where cuttings settled around and froze a parted section of drill pipe, and that contractor has returned to the use of mud in the belief that slower penetration rates are preferable to

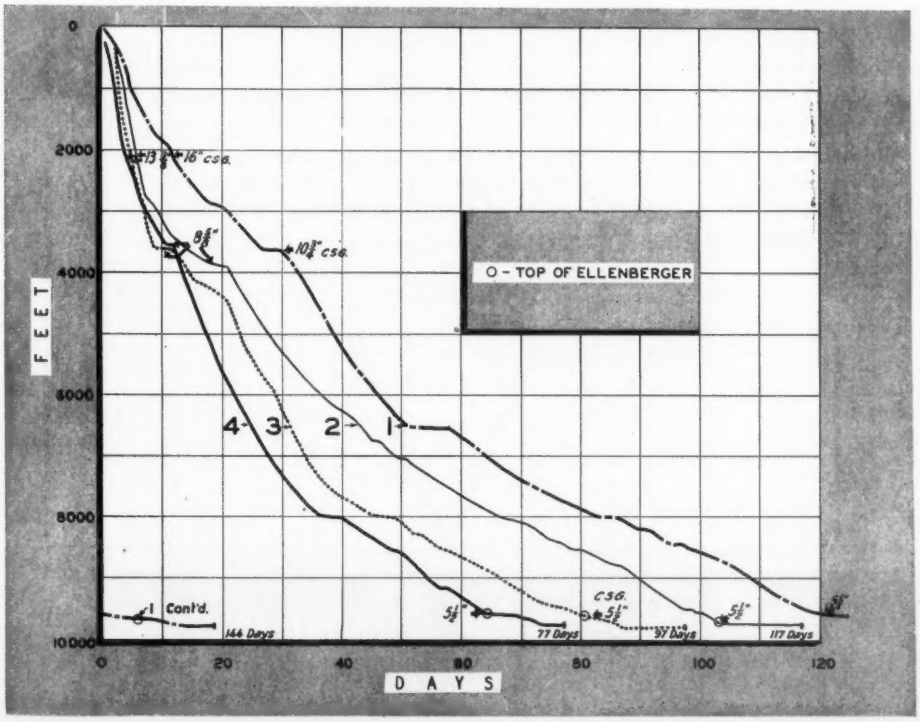
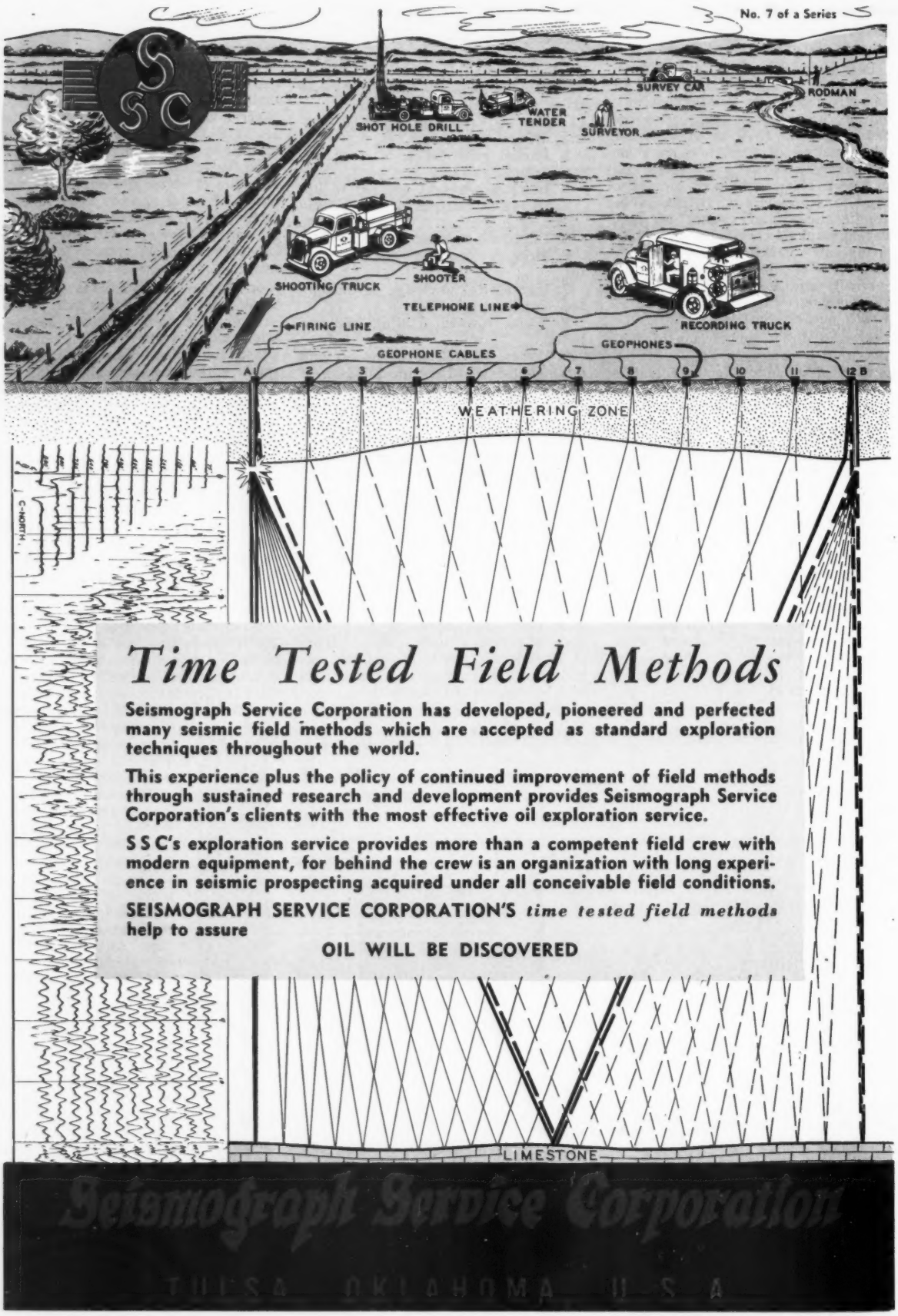


Fig. 3—Drilling-time chart, four Ellenburger wells, TXL field



Time Tested Field Methods

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the added risk of bad fishing jobs.

Application of greater weight to the bit, coupled with slower rotation speed when drilling hard formation is by now established practice in the area. Practically all contractors and oil companies following this practice employ a string of drill collars immediately above the bit, varying the dead weight depending on size of hole, up to 40,000 lb. Thus the driller can maintain weight on his bit and still hold the remainder of his drilling string in tension. This is credited with a considerable reduction in drill pipe failures particularly where corrosion is present. Whipping of the drilling string is further reduced by slowing rotation speeds. A yardstick often followed is to slow rotary speed 1 r.p.m. for every 1,500 lb. of drill collar weight added above the bit, bringing rotation in most cases down to around 50 r.p.m.

Increased Crew Efficiency

Added weight increases the danger of a crooked hole. This is true particularly in drilling formations with considerable dip, for the bit tends to drill into the formation in the updip direction. When detected in time, the situation is easily remedied by taking greater tension on the string and drilling with a lighter bit load for the next several feet.

Crew efficiency has improved as a result of better drilling equipment, return of experienced labor from the armed service and increased experience on the part of new hands. Relief from war-time manpower shortages is also felt in the improvement in field services. Service companies have increased field personnel and have improved equipment and methods to eliminate much lost time in logging, surveying and measuring holes, in cementing and perforating casing and in acidizing formations. Reduction in drilling activity has also relieved over-worked service crews and services now wait on wells, instead of wells waiting on service units as was true a year ago.

Arrival of several new heavy rigs in West Texas, featuring improved centralized drilling control, increased flexibility of operation and greater power is a definite contribution to faster drilling. Such refinements free the driller and his crew for other necessary duties, and use of instruments and recorders allow the driller to concentrate more attention on drilling technique during rotating hours. Improved weight control and closer watch on penetration rates have resulted in some drillers getting an estimated 25 per cent more footage out of rotary bits.

Bits themselves have undergone improvement. One contractor who drilled five 7,500-ft. wells in the same field sector over a period 3 years using identical practices, considers bit improvement responsible for reducing his drilling time by 20 days.

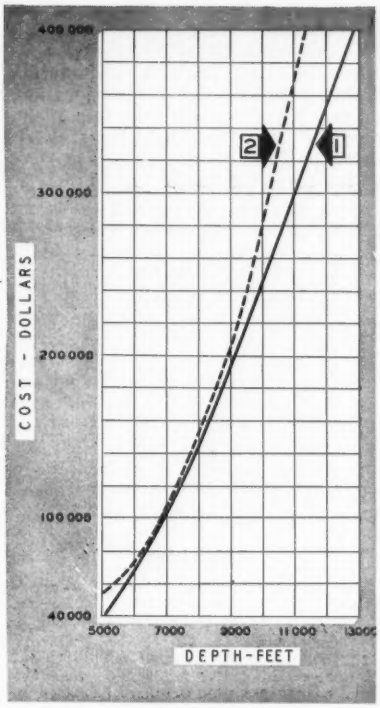


Fig. 4—Well costs, West Texas and New Mexico

Trend to Slim Holes

During the past 2 years a definite trend has developed toward drilling slimmer holes, and most wells now completed in proven fields are set with 5½-in. production casing. The main reason is lower casing cost, but hole size also affects drilling time. Dual completions are not popular in the area and so exert little influence in drilling larger holes. In addition to the dim view taken of dual completions by company engineers, the existence of considerable subsurface corrosion will probably prevent appreciable adoption of multiple completion practices in the area.

In fact, threat of corrosion may reverse the trend to smaller hole diameters in favor of 7-in. production casing strings. Some operators are considering uniform adoption of the larger casing which will allow future lining with 5½-in. casing should corrosion attack the original casing.

Control of drill pipe corrosion is still in the investigation stage, although some progress in the problem is responsible for reducing fishing jobs. Due to what is now established as corrosion fatigue, drill pipe failures increased at an alarming rate in recent years. An intensive investigation is now being conducted under the auspices of the American Association of Oilwell Drilling Contractors in West Texas and New Mexico. The use of sodium and bi-sodium chromates in drilling fluid is believed effective in arresting corrosion, but sufficient history is not yet available to draw definite conclusions. Caustic is widely used in drilling muds, but its benefit of high pH value is questioned by some engineers who believe that it may in fact cause corrosion under such conditions.

Drill pipe failures are being prevented to some extent by minute examination of exterior and interior of drill pipe both new and used. Many contractors have adopted a program of frequent inspection by field services which spot pits and flaws and eliminate use of bad sections in deep drilling.

Well Costs

An appreciable reduction in well costs has attended the decline in drilling time required on such wells. The bulk of deep operations were contracted to 7,500-8,000 ft. plus a straight rate on a per day basis to greater depths. The savings accrued by faster drillings have been passed on to the oil operator through lower contract figures and shorter drilling periods below contract depth.

Two estimates of well costs in the hard formation area are shown in Fig. 4. Curve No. 1, based on the cost of 27 selected Permian Basin tests, many of which were wildcats, was used by an advisory committee appointed by the New Mexico Oil Conservation Commission to depict well costs in Southestern New Mexico. It was accepted early this year as a basis for fixing allowable increases for wells exceeding 5,000 ft. to afford operators an average 4-year payout of actual drilling costs.

The cost estimate used by New Mexico is more conservative than reported by Ragland[2] late last year (curve 2). His estimates are based on West Texas tests drilled during 1944 and 1945.

Due to the recent reduction in drilling time, present average cost of field wells in the area is appreciably lower than either curve indicates in the depth range of 6,500-10,000 ft. At greater depths and for most wildcats throughout the depth range, the curves are considered representative today.

Any study or prediction of future well cost based on present conditions is of very doubtful value, for several reasons. Two predominant influences in the present cost situation indicate a halt in cost reduction if not a reversal of the recent trend. The first is increased prices for supplies, equipment and labor, which are now beginning to show their full effect. Per day drilling costs have been rising for some time, and only sharp drilling time reductions offset these rising costs. The second important factor affecting well costs, then, is the strong indication that drilling time is leveling off, and progress will not continue in the degree felt in the

past 18 months. Present techniques are approaching perfection by many contractors and time records will become increasingly hard to better.

Cost reduction as related to improved penetration rates approaches a limit even before actual time reduction. This is due to the existence of such fixed costs as derrick erection, rigging up, digging pits, etc. As actual drilling time declines, such fixed factors assume greater proportions of the total well cost.

In addition, many of the aids to better drilling time increased investment in equipment, although their use resulted, during the progress of marked drilling efficiency, in a net cost reduction on wells. Many contractors are now studying the economic limit to added investment in drill collars, new instruments, steel mud pits and better controls in so far as they affect time reduction itself. Such drilling aids will see continued and, without doubt, added employment, but their direct effect on further reducing drilling costs as a result of cutting time is now questioned.

A decline in active operations during the past several months has brought about the stacking of about 50 rigs in the area, and a recent count shows about the same number of rigs temporarily inactive. This means increasing competition for drilling contracts and the probable elimination of less efficient rigs from operation, unless higher crude prices and the prospect of added pipe line outlets bring about a resumption in drilling at the former volume.

Still another change in Permian Basin drilling may affect future well costs. An increasing number of wells are now being contracted to total depth, transferring added responsibility and risk to the contractor. Such contracts even containing "chert clauses" which allow increased payments if extremely hard formations are encountered, should be expected to cause many contractors to restudy operating costs and revise bids for the added hazards of drilling deep wells in a difficult and often treacherous development area.

References

1. "Penetration Rates in Hard Formation Drilling" by J. E. Warren and R. B. Schabarum, The Oil and Gas Journal, June 8, 1946, p. 82.

2. "Drilling Equipment Needs" by Douglas Ragland, presented before American Association of Oilwell Drilling Contractors, Oklahoma City, October 7, 1945.

Continental Streamlines Wichita Falls Refinery

(Continued from page 86)

psi. at a charging rate of 1,000 bbl. per day of naphtha and 5,000 bbl. per day of side-cut stock from the pressure-bubble tower. Under the foregoing conditions of operation the temperature rise in the heater coil is near 360° F. with the outlet at 960° F. Temperature rise through the vis breaker coil is about 280° F. with an outlet temperature of 905° F., approximately, when the throughput is near 2,760 bbl. per day of crude tower bottoms and 3,240 bbl. per day of pressure-tower bottoms. With the rate for the combined stocks coming to 6,000 bbl. per day the pressure drop through the heater coil is shown to be in the range of 250 psi.

Overhead from the evaporator passes through the shell side of the last battery of exchangers in the crude circuit and thence to the bottom section of the pressure tower. A new vessel, the evaporator operates at 75-80 psi. and about 800° F. Bottoms from this vessel, a fuel-oil, are used as quench material and some of its heat is recovered with a plant-constructed steam generator.

Gas oil taken off of the lower section of the pressure tower passes into a receiver drum from which the hot-oil pump serving the naphtha reformer removes stock at the rate of about 5,000 bbl. per day. Manifolded into a common suction header, which connects into the receiver tank, is a reciprocating pump for evaporator-wash service and two centrifugal units. The reciprocating pump was in previous service before being installed in the present unit but the centrifugal units are new.

One of the units is driven with an electric motor whereas the other, in service as a spare, is powered with a turbine. Discharge from these pumps is split into two streams with about 700 bbl. per day going to the heater units at the diesel and kerosene strippers and to a reboiler in the alkylation unit in one stream. About 4,000 bbl. per day is pumped through the other branch of the split stream to the shell side of the third exchanger battery in the crude circuit and is then returned to the tower for side reflux.

Temperature of the gas oil split-stream after leaving the exchanger is in the range of 475° F. and before it enters the tower the return stream from the reboiler and stripper-heating units is brought back into the circuit resulting in the stream falling to a temperature substantially lower than 475° F. before entering the tower as side reflux. A bleed stream, which enters into the evaporator wash outside of the vessel, is taken off of the pressure tower side reflux stream just after it leaves the exchanger. Another stream is taken from the receiver for use as lean oil to the absorber and is returned to the middle of the pressure tower after passing through the absorber.

A box-type condenser-cooler and tubular after coolers lower the temperature of the overhead material from the pressure tower to about 140° F. The overhead condensate and gases pass into a receiver from which the reflux pump or its standby, both Goulds units, deliver reflux to the top of the tower. The reflux pump, a 3-stage electric motor driven unit rated at 200 g.p.m. 330-ft. head, shows a previous service record of 14 years.

Product material from the receiver is cooled to near 115° F. by a bank of tubular units before entering the pressure gasoline separator. About 3,000 bbl. per day of condensate is removed from the separator with a previously used, turbine-driven pump which discharges to the refinery's pressure gas stabilizer unit. Vapors from the P.G. separator are delivered into a compressor knockout drum which operates at about 30 psi. lower pressure than the separator. Condensate is removed from the accumulator or knockout drum with a Dean simplex unit and is returned to the P.G. separator. Gases from the accumulator are picked up with a 2-stage, 300-hp. compressor which discharges into a separator via a tubular cooler. Condensate from this separator is run to the P.G. stabilizer and the gases are delivered to the absorber. Residue gases from the absorber pass into the plant's fuel system.

Normal yields for the combination unit, when processing 6,000 bbl. per day of North Texas crude and operating to reform naphtha are shown in the accompanying tabulation of yields:

TABULATION OF YIELDS

Product—	Barrels per day
Stabilized S.R. gasoline	1,850-1,900
S.R. naphtha	0
Kerosene	530-550
Diesel oil	295-305
Stabilized P.G. gasoline	2,450-2,500
S.R. light ends	350-360
P.G. light ends	790-800
Fuel oil	940-950

In addition to the crude 830 to 840 bbl. per day of casinghead and about 500 bbl. per day of unstabilized poly distillate are processed in the unit. Casinghead is introduced into the process at the crude tower and the poly distillate enters via the pressure tower.

BOOKS

DIRECTORY OF TEXAS MANUFACTURERS. Published by Bureau of Business Research, University of Texas. 413 pp. $2.50.

By the periodic issuance of this directory, the bureau seeks to provide information which will aid in the economic and business development of Texas. Section 1 lists manufacturers in the state classified by products, and Section 2 lists manufacturers classified by cities. Where byproducts result from certain manufacturing processes, as in the production of cottonseed oil or refinery gasoline, cross references are made that indicate the general headings.

A FEATURE OF THE OIL AND GAS JOURNAL

Preparation of Contour Maps

In addition to direction and distance, map makers must consider a third dimension, vertical distance or elevation. This measurement is usually expressed in the form of contour lines. Contour lines cannot be drawn, however, until the elevation of certain ground points have been determined. In this installment three of the four common field procedures used to determine elevation are described, and a discussion given on the sketching of contour lines.

A CONTOUR map is one that shows the features of the terrain by the use of lines called "contours" that connect all points of the same elevation. Such a line represents the ground trace formed by an imaginary horizontal plane at its point of intersection with the ground surface. Horizontal planes are taken at whole feet intervals, usually at 1, 2, 5, 10, 25, or 50-ft. values; the size of the interval is selected by the observer. Contour lines when placed at any of these intervals on a contour map are said to be drawn at the same contour interval. The contour interval is therefore seen to be equal to the vertical difference in elevation between any two adjacent contour lines of higher or lower elevation.

Characteristics of Contours

Before anyone can interpret properly a contour map he should have a fairly clear conception of the characteristics of contour lines. The primary characteristic of a contour line is that stated in its definition above, namely, a line on a map connecting all points of equal elevation on the ground. Other principal characteristics of contours are: (1) On uniform slopes the horizontal distances between adjacent contour lines are equal. (2) On plane surfaces contour lines are spaced equally and are parallel. (3) Contour lines close upon themselves either within or without the scope of the map. (4) Closed contours represent either summits or depressions. (5) Contour lines cannot divide, neither can a single contour line occur between two identical contour lines of lower or higher elevation. (6) Contour lines cross ridge and valley lines at right angles, hence they are perpendicular to the lines of steepest slope. (7) Contour lines are close together on steep slopes and farther apart on gentler slopes. (8) Contour lines rarely cross one another and if they do they cross an even number of times, such as at overhanging cliffs. These characteristics are illustrated by sketches in Fig. 1. The letters in parentheses in the figure refer to the characteristics as listed immediately above.

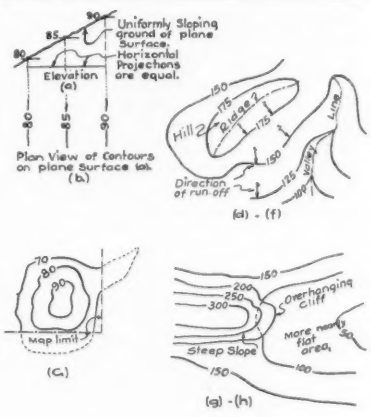
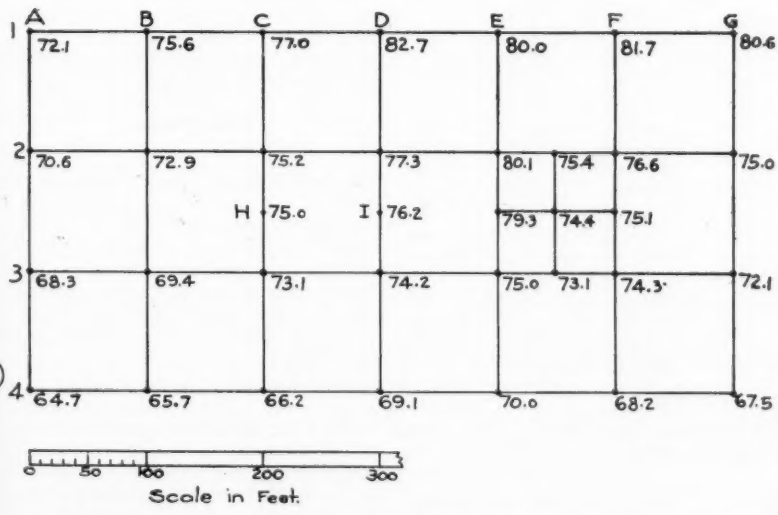


Fig. 1—(Right) Sketches showing the characteristics of contour lines, and how their spacing can be interpreted into ground forms. Fig. 2—(Below) Use of the X and Y-coordinate point method of preparing the contour map



Field Procedures

Contour lines cannot be drawn until the elevation of certain ground points have been determined. These are usually obtained by following one of four common field procedures, known as the controlling-point method, the trace-point method, the X and Y coordinate-point method, and the cross-section control-point (or the cross-section trace-point) method. The field method employed is determined by several factors. Included are such features as the area to be surveyed, the use to which the map is to be put, the accuracy required, the type of the terrain being mapped, surveying equipment available, etc. In the previous article dealing with "The Principle of Stadia and Stadia Surveying" some discussion was given of the controlling-point method.

Trace-point method. — The trace-point method is generally used in two situations, such as in marking out and mapping the shore line of a proposed reservoir, or in locating contours of areas where it is difficult, if not impossible, to recognize points at which the slope changes. For maps drawn of such areas the contour interval is usually small, 1 or 2 ft. The trace-point method requires that by a cut-and-try process points be located all of which have the same ground elevation. They would, therefore, all be on the same contour or they would locate the shore line of any reservoir. Such points are determined in the field by a level, transit, or

Series prepared by Dr. E. A. Stephenson, head of petroleum engineering school, and Prof. D. Don Haines, department of civil engineering, University of Kansas

Engineering Fundamentals (Continued)

hand level. If it is necessary to draw a map of the area the relative horizontal position of the points must also be determined. One way to do this is to run a traverse from point to point. Generally the azimuth of each line is determined; and its horizontal length is found by stadia. Since all the sights are horizontal the distances can be computed readily from intercepts. When these points are plotted on a map to some chosen scale and are connected by a line drawn free-hand, the result is a fairly accurate delineation of the ground surface.

X & Y coordinate point method.—The X & Y coordinate point method is commonly used on small areas although recently some very large areas have been surveyed by this method. The area is divided into squares (Fig. 2) by laying out the perimeter, marking off regular units along the sides, then projecting lines to their point of intersections. The sides of the squares are usually 100 ft. although if smaller units are used the map will be more accurate. These cross lines may be laid off with a transit but more generally they are sighted in by eye. Levels are then run to determine the elevation of the ground at the points of intersection. Rod readings are taken to the nearest 0.1 ft. and the elevations computed accordingly. For gently rolling areas the method is quite accurate. For those areas where abrupt changes occur it is necessary, in order to make the method useful without dividing the entire area up into smaller units, to amplify the procedure. Generally, intermediate readings are taken, as at H and I in Fig. 2, or a portion may be divided into smaller parts, such as the area between lines E and F, and 2 and 3.

Cross-section point method.—The cross-section point method is used where a contour map of a long narrow area is needed. Such a map is useful when drawn for the area falling on both sides of the proposed tentative centerline of irrigation ditches, drainage ditches, and the like. By either the controlling-point method or the trace-point method rod readings are taken on either side of the center line along cross-section lines (lines at right angles to the center line). With the distances known from the center line to the points where the rod is held, strip contour maps can be drawn for the area. Such a map is shown in Fig. 3. The first part represents data taken by the cross-section controlling-point method and the second part those taken by the cross-section trace-point method. Chief difference between the two methods is that the position of the contour lines by the controlling-point method must be found by interpolation in the office while in the trace-point method the interpolation is done in the field.

Sketching Contour Lines

No matter what field procedure is followed to obtain the elevation of ground points after these elevations are plotted, contour lines must still be sketched in. When the controlling point method is used interpolations must be made to find points having elevations that are multiples of the contour interval. This interpolation is usually done by estimation assuming a uniform slope between the two points of known elevation, as illustrated in Fig. 4, which shows A and B at the bottom and top of a slope. The plan view shows the two points as they would appear on any map with the elevation of the two points indicated. The problem is to locate the point on the straight line joining A and B in Fig. 4 which has, let us say, an elevation 80 ft. The difference in elevation between A and B is 87.1 ft. — 66.2 ft., or 20.9 ft.

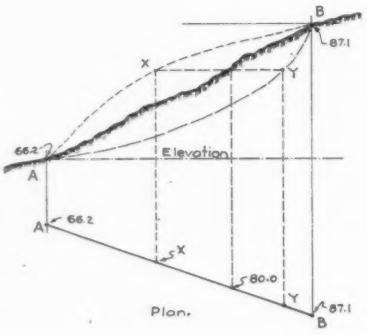
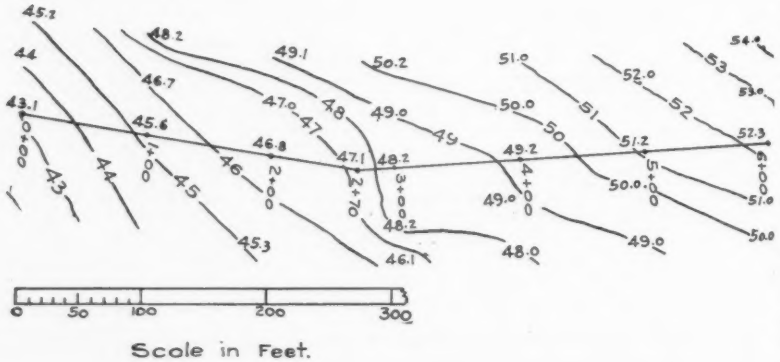


Fig. 3—(Below) Use of the cross-section point method of preparing a contour map, used where a long narrow area is needed. Fig. 4—(Right) Plan view illustrating how contour lines are drawn in between two points of known elevation



A point having elevation 80.0 ft. is 13.8 ft. above point A, hence the point is 13.8/20.9, or approximately two-thirds of the distance from point A to point B. This distance is usually estimated although in some cases scalar values are used. Should the ground between A and B slope as shown by the dotted line in the figure, the point at elevation, 80 ft. would fall at X; should the ground surface be concave, as shown by the dashed line, then the point of elevation, 80 ft., would fall at Y. The distance between X and Y is seen to be appreciable which tends to emphasize the fact that contour lines can be sketched in, at best, only approximately. However, if the surveyor sketches in contours in the field he can tell whether the land between A and B is convex or concave and can take this into consideration as he estimated the position of any point falling between A and B. Generally speaking, contour maps drawn by sketching in contours in the field are more accurate than those drawn entirely by interpolation in the office. If the surveyor does not plan to return to the field to sketch in contours he should take many more field observations to produce a map of equal accuracy.

The discussion above and Fig. 4 illustrate the controlling-point method. It applies equally well to the X and Y coordinate-point method as illustrated in Fig. 2, or the cross-section controlling-point method. In any form of the trace point method ground points falling on the contour line have been located, but judgment must still be exercised as the contour line is drawn from one such point to the next in order to make it represent as closely as possible the actual ground surface.

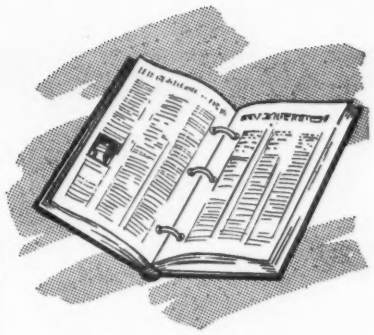
Map Scales

Typical contour maps of the U. S. Geological Survey are drawn to a scale of 1 in. = 1 mi., approximately. Actually such maps have a representative fraction of 1/62,500. This means that one unit of map distance corresponds to 62,500 units on the ground. Other common representative fractions are 1/80,000 and 1/125,000.

Most contour maps as used by engineers for planning and for estimating are drawn to a scale of 1 in. = 100 ft. to 1 in. = 1,000 ft. By far the majority fall within the range of 1 in. = 200 ft. to 1 in. = 400 ft. The usual contour intervals on the latter maps are 2 ft. or 5 ft.

The Refiner's Notebook

A WEEKLY FEATURE OF THE OIL AND GAS JOURNAL



Pipe-Still Duty

In No. 104 of this series, in the August 3 issue, there was a transposition of captions describing various types of illustrated pipe-still arrangements. The page will be repeated, with drawings properly labeled, in the August 24 issue, as an extra page of The Refiner's Notebook.

THE capacity of a pipe still is usually stated in millions of British thermal units per hour, and this figure is referred to as the **duty** of the pipe still. Thus, a particular job of heating is referred to as "a duty," or a still may be described as being able to perform a certain maximum duty.

Law of conservation of energy.—The outlet temperature of a pipe still is seldom computed or known with accuracy and if it is known from plant operations there is no easy way to ascertain the amount of vaporization that has occurred in the still. Methods of computing the pressure drop, temperature gradient, and amount of vaporization at the outlet will be presented in The Refiner's Notebook about 3 months from now but such computations are so laborious and so fraught with possible inaccuracies that the most accurate way to compute the duty of a pipe still is to utilize the law of Conservation of Energy (First Law of Thermodynamics). Although this method of computation does not duplicate nor follow the actual mechanism of what happens in the pipe still, it gives final answers that are accurate. Finally, the method is simple.

The duty of a pipe still amounts simply to the heat required to raise the temperature of the material to the tower vaporizer temperature, plus the heat of vaporization (and any heats of reaction) of each of the products vaporized. The heats of vaporization at vaporizer temperature and pressure should be used. This amounts to the following operations:

1. Obtain the distillation curve of the feedstock (Notebook No. 24, p. 277, Dec. 30, 1944).

2. Determine the yields of products by analysis or by the use of the methods outlined in Notebook Nos. 26 (p. 91, Jan. 13, 1945) and 31 (p. 151, Feb. 24, 1945).

3. Draw flash vaporization curves using Notebook Nos. 34, p. 125, Mar. 19, 1945; or 37, p. 143, Apr. 14, 1945.

4. Determine the vaporization temperature by reading the temperature on the flash curve for vaporizing the overhead products, or if steam is present compute its effect as in Notebook No. 39, p. 147, Apr. 28, 1945.

5. Heat the entire feedstock as a liquid to the vaporizer temperature using the specific heat of liquids given in Notebook No. 40, p. 121, May 5, 1945.

6. Compute the heat of vaporization for each of the overhead products of the tower using latent heats from Notebook No. 43, p. 163, May 26, 1945, and using the vaporizer temperature as the temperature at which vaporization occurs.

7. The sum of items 5 and 6 above is ordinarily the pipe-still duty. However, if some decomposition or other chemical reaction occurs, the heat of decomposition or reaction should be added to the above. Theoretically, the heat of reaction should be computed for the vaporizer temperature but inasmuch as heats of reaction are most frequently given at 60° F. and inasmuch as the correcion of the heat of reaction to other temperatures is usually very small, the heat of reaction at 60° F. is normally employed.

The method does not follow the conditions actually existent during the heating. In actuality, the oil begins to vaporize during its passage through the pipe still. All of the vaporization, however, does not occur as the oil attains the temperature of the vaporizer because of pressure in the still. The pipe-still outlet temperature is higher than the vaporizer temperature by 10° to 100° F. depending on the amount of vaporization that has occurred at the still outlet or the amount of vaporization yet to occur in the transfer line between the still and the tower. Irrespective of these differences in physical details, the method suggested here gives the same results as those that would be attained if the true details of the heating were laboriously computed.

Example.—In the illustration which follows, the item numbers used above in explaining the computations will also be used here, so that the computations can be followed with ease:

Four thousand barrels per day of the 37° A.P.I. paraffin intermediate base crude oil of Notebook No. 31 (Feb. 24, 1945) will be heated from 300° F. (exchanger-outlet temperature—all liquid) to a temperature sufficiently high to produce the following yields:

	Per cent
Loss	1
87-Octane gasoline	12
Third-grade gasoline	16
Kerosene	6
Diesel fuel	16
Gas oil	12
Topped crude	37

1. and 2. Crude and yields — see Notebook Nos. 24, 26, and 31.

3. Flash Curve—see Notebook Nos. 34, 37, and 39.

4. Vaporizer temperature — if no steam is used the temperature for vaporizing 63 per cent is 655° F. or at a tower pressure of 10 psig. about 695° F. Note Notebook No. 39.

5. Heat liquid—The pounds of various materials must be determined using property evaluation curves (Notebook No. 26) or other sources to obtain the A.P.I. gravity, pounds per gallon, and total pounds, thus:

	G.p.h.	A.P.I.	Lb. /gal.	Lb.
Loss	....	....	3.5	245
87 Gasoline	840	64.5	6.01	5,050
Gasoline	1,120	51.0	6.46	7,240
Kerosene	420	44.0	6.71	2,820
Diesel	1,120	37.3	6.98	7,820
Gas oil	840	31.5	7.23	6,070
Crude	7,000	37.0	6.99	48,900

Obtain specific heat from Notebook No. 40 for a 12 characterization factor oil at an average temperature of 269° F.:

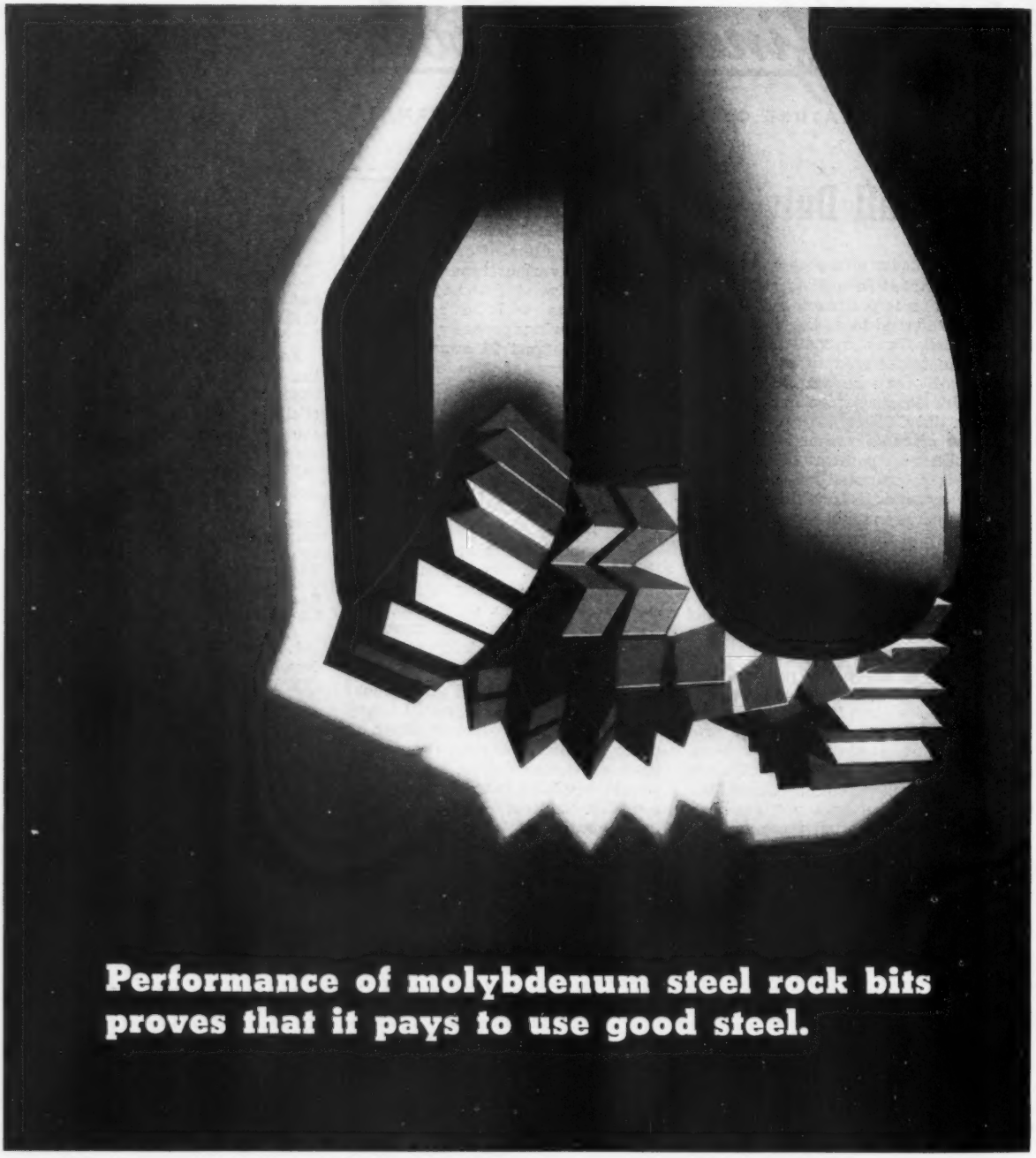
To heat liquid
= 48,900 (695 — 300) 0.57 × 1.02
= 11,200,000 B.t.u. per hr.

6. Latent heats at 695° F. — see Notebook No. 43 and use average of values for paraffin and Mid-Continent stocks:

Gasolines	12,290 × 0	=	0
Kerosene	2,820 × 54	=	152,000
Diesel	7,820 × 72	=	563,300
Gas oil	6,070 × 73	=	443,000
B.t.u. per hour			1,158,000

7. Duty—The sum of items 5 and 6 is 12,358,000 B.t.u. per hour.

No. 106 in a series by W. L. Nelson, professor of petroleum refinery engineering, University of Tulsa



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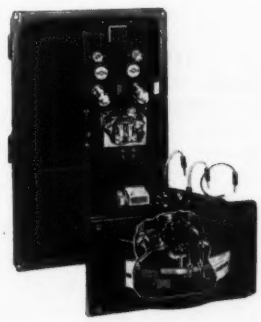
OIL AND GAS EQUIPMENT Digest

IT'S NEW CHECK IT

by L. L. Jones Jr.

(1) NEWLY DESIGNED MULTRONIC CAPACITROL adds further flexibility to meet a multitude of applications requiring instantaneous, accurate indication and control of temperature, voltage, current, signalling, and similar variables in process industries. Two electronic control circuits (no mechanical contact) operate in harmony with each other, but independently, to control the variables as measured by an accurate indicator providing immediate control action. *Wheelco Instruments Co.*

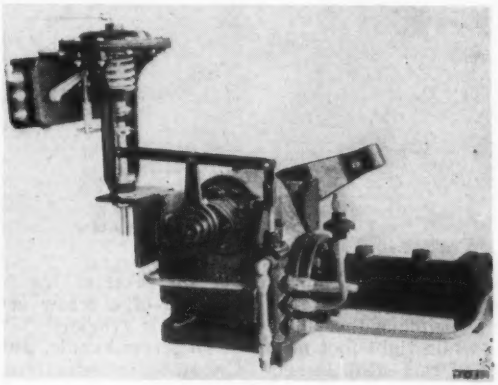


IT'S NEW CHECK IT

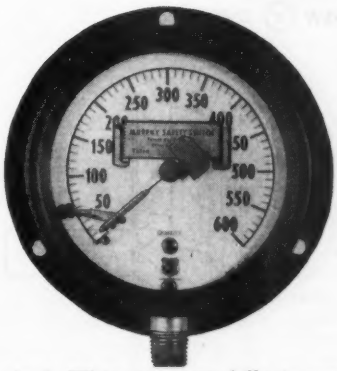
(2) PARAFFIN SCRAPING TOOL that can be run inside pipe on a wire line is now on market for the industry. Wire loops on tool cut through paraffin, breaking it up so it flows out of well. The loops are sturdy enough to cut paraffin efficiently but are flexible enough to yield in order to prevent sticking at tight points in the tubing. Tool can also be dressed to go through an unloading valve. *Derneal Supply Co.*

IT'S NEW CHECK IT

(3) OIL OPERATED HYDRAULIC BOOSTER cylinder for air operated controllers is a wartime development of a large regulator firm. Using a standard diaphragm top, it provides high power amplification and permits exact positioning of heavy dampers, valves, and the like, in accordance with the applied pneumatic loading pressure which is usually 0 to 15 psi. *Askania Regulator Co.*



IT'S NEW CHECK IT



(4) SAFETY SWITCH FOR PIPELINE PUMPS shuts off pumps automatically. This has resulted in prevention of damage to equipment and also the saving of many miles driving or walking to shut the pumps down. Pumper in the field can easily adjust to the low pressure shutdown point desired. When pressure falls to predetermined low, pump is then shut down. Contact points are made of 99 per cent pure silver for positive operation and are fully visible at all times for inspection. Any gage repairman can repair or recalibrate this switch. *Frank W. Murphy, Mfr.*

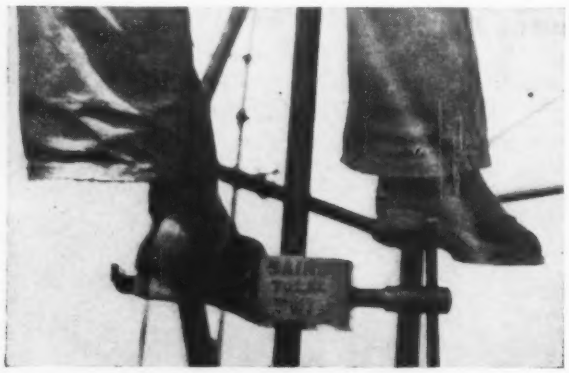
IT'S NEW CHECK IT

The Oil and Gas Equipment Digest presents a review of what is new in equipment and trade literature . . . makes it possible for readers to obtain full information on every subject by use of convenient "Check It—Mail It" service card. This periodic feature of The Oil and Gas Journal will include all that is new in equipment . . . at a time when new products are being introduced, and existing products improved.

Keep Informed. Save Time. Tear Out Card. Check It. Mail It.

OIL AND GAS EQUIPMENT Digest — IT'S NEW — CHECK IT

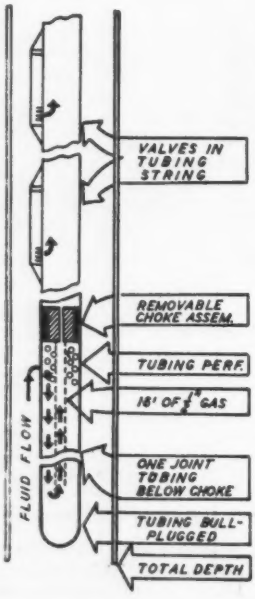
(5) POLISH ROD SAFETY STEP made on a vise-like principle by Tulsa manufacturer provides maximum of safety to workmen when climbing on pumping equipment to service or repair rocking arms, hanger heads,



or other parts of pumps above the level of the floor. Safety step clamps tight, by means of a screw action, to any point on the polish rod. Step is provided for left foot, while right foot may rest on screw handle. Step is made of cast steel. Danger of slipping is virtually eliminated. Will not damage polish rod. *Baird Mfg. Co.*

IT'S NEW — CHECK IT

(6) CONTROL OF EXCESSIVE GAS TO OIL RATIOS can now be brought about by the use of a new patented bottom hole choke-gas anchor installation. Termed a fluid seal by the manufacturer, a dual purpose is fulfilled when these seals are installed. Results are: (1) The comparatively gas-free liquid entering the tubing is aerated and flow to the surface accomplished. (2) Injection of gas into the tubing from the casing effects a continual slight bleeding pressure off the casing, thus helping to maintain the fluid level and the fluid seal. *The Halbert Co.*

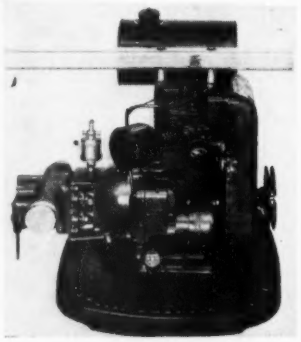


IT'S NEW — CHECK IT

(7) TOOL JOINT DOPE BRUSH AND TUBING BRUSH designed to prevent loss of brushes in the pipe have been declared very efficient by drilling crews that have already used them. Dope brush has rubber guard 6 in. long which prevents falling down in drill pipe. Guard is movable and will slide along the handle to fill the need of the workman. Tubing brush has wire handle which can be bent at end to prevent loss. Economy of lubricants used is another feature of the brushes. *W. D. Moore Co.*

IT'S NEW — CHECK IT

(8) NEW PORTABLE HIGH PRESSURE UTILITY PUMP that uses rubber impellers exclusively is now available for oil field and other commercial use. High pressure of pump affords fire protection to oil camps and small communities where high-priced pumping equipment cannot be bought. Portability of pump makes it highly desirable for use in areas where danger of small fires is always present. Dirty water from ditches and ponds does not affect rubber impellers. *Porto-Pump Inc.*

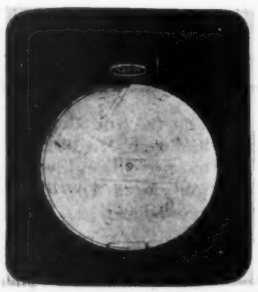


IT'S NEW — CHECK IT

(9) PEENING AND SCALING HAMMER powered by air. Designed for cleaning scale on welds, removing carbon from cylinder heads, expanding pistons, peening tubular rivets and other small parts. Will not distort light gage metal when removing scale. Body of the tool is cast aluminum with automatic throttle valve. Would be very useful on drilling rigs when urgent on-the-job repairs or service jobs are needed. Pressure from small compressor would be standard equipment. *The Aro Equipment Corp.*

IT'S NEW — CHECK IT

(10) NEW CONTROLLER embodies improvements in design and construction which offer new advantages that are important and numerous enough to characterize a wholly new instrument. This new model replaces the older model as the instrument recommended for control of temperature, pressure, flow, and other variables in continu-



ous processes, or others in which control requirements are exacting. *The Foxboro Co.*

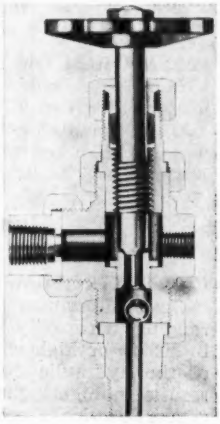
IT'S NEW CHECK IT

(11) THE BONANZA, a new 4-place 165-hp. airplane built by the manufacturers of many military proven aircraft. Designed for the average air-minded family, the Bonanza should be the answer to most "what plane

should I buy" questions. All-metal fuselage and fully retractable tricycle landing gear plus a new novel "butterfly" tail assembly give the Bonanza the distinction of being the first unique "big plane" in the low price field. *Beech Aircraft Corporation.*

IT'S NEW CHECK IT

(12) UNION CONNECTED GAGE-VALVE with union connection to both the gage and the vessel. This arrangement makes it possible to remove the gage for inspection or maintenance without disconnecting the valves. Such a valve is very useful where it would not be practicable to shut down operations for removing the gage. The two valves are merely closed and the union connection to the gage unscrewed. The gage is then removed and operations continue without interruption. *Jerguson Gage and Valve Co.*



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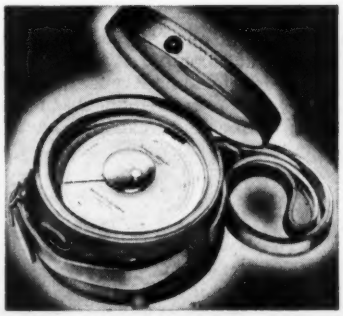


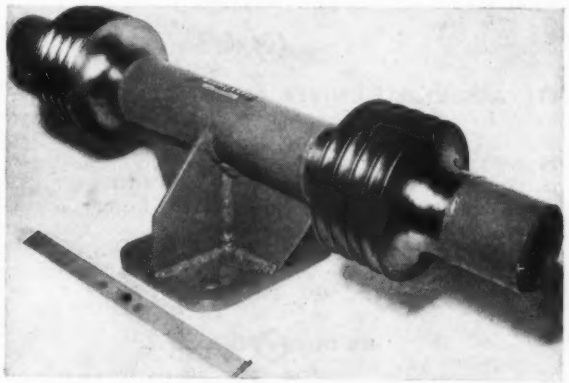
(13) NEW SURVEYING ALTIMETER to cover all ranges of elevation above and below sea level. Laboratory tests have shown these instruments to respond to elevation changes in inches. Throughout the entire range accuracy is better than one part in one-thousand. Each instrument comes encased in a leather carrying case with hand and shoulder straps and will withstand the jolts, jars, and vibrations in all conceivable field uses without affecting the sensitivity or accuracy. Over-all weight with leather case is only 2 lb. *American Paulin System.*

IT'S NEW CHECK IT

OIL AND GAS EQUIPMENT Digest

IT'S NEW CHECK IT

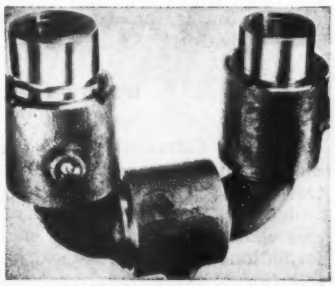
(14) ANCHOR JOINT is newest in line of packless expansion joints. The joint combines rigid anchoring of piping at accessible points, with allowance for unequal thermal expansion and contraction on either side of the anchor point. This is accomplished by varying the number of bellows flanges on either side of the anchor base



to accommodate each condition encountered. Joints are made for standard pipe sizes from ½ in. to 2 in. *Magni-Lastic Div. Cook Electric Co.*

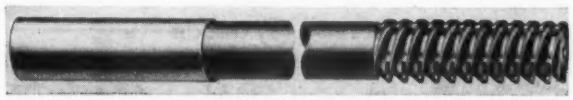
IT'S NEW CHECK IT

(15) HIGH PRESSURE SWIVEL FITTING designed to eliminate torque and to operate flexibly under all pressures. It is restricted to free turning only by the friction load on the double rows of balls and the internal pressure exerted on a small section of the self-sealing packing unit at the point of rotation. Specially moulded one-piece packing unit provides a tighter seal with increased pressures. *Earle R. Atkins Co.*



IT'S NEW CHECK IT

(16) ROTARY BROACH designed to accomplish molecular cleavage. Tool is a broach that rotates as it cuts. Broach is made with high spiral or helical cutting edge



and when end pressure is applied, these cutting edges remove metal in a true shearing manner. The tools are being marketed in sizes from ¼ in. to 1 in. and from 1⅛ in. to 1½ in. with straight shanks only. Larger sizes can be supplied on special order. The broaches end hole trouble by producing perfectly finished holes. *Fearless Tool Co.*

IT'S NEW CHECK IT

TRADE LITERATURE

(17) TESTING OF LOCKING EFFECTIVENESS of self-locking nuts and related locking devices is covered in a 16-page booklet entitled "Test Procedure." The booklet describes in detail the equipment and procedure for making tests for vibration, installation and removal torque, reuse torque, and wearing and plating. It also explains how to evaluate these tests in connection with individual fastener problems. *Elastic Stop Nut Corp. of America.*

IT'S NEW ✓ CHECK IT

(18) A PORTABLE UNIVERSAL TESTER is covered in detail by a new multicolored booklet designed to answer any and all questions concerning an instrument of this type. Materials testing has benefited widely because this particular tester has simplified the task. In the words of the manufacturer "it has made tester history because it costs little, weighs little, uses little space and takes less time for operator instruction." Instrument also handles a wide range of specimens in size, shape, and material. *W. C. Dillon & Co., Inc.*

IT'S NEW ✓ CHECK IT

(19) NEW ROD SELECTOR CHART has just been issued for distribution throughout the industry. This chart, in addition to listing the products offered by the company and their suggested applications, also contains factual information which will be greatly appreciated by all those doing welding. The bonding and remelting temperature is given for each alloy as well as the Brinell hardness. Another column features the strength in psi. of these low temperature welding alloys. *Eutectic Welding Alloys Corp.*

IT'S NEW ✓ CHECK IT

(20) NEW CONTROL VALVE CATALOG contains complete factual information and covers every phase of control valve selection, including valve flow coefficient which is a basic means for comparing flow capacities and characteristics. Covers in detail much essential information such as material, construction, application, selection of types, handwheels, dimensions, weights, and other specification data. *Mason-Neilan Regulator Co.*

IT'S NEW ✓ CHECK IT

(21) FLEXIBLE COUPLINGS are described and illustrated in detail in a new colorful brochure. Printed on the order of a catalog, this booklet covers installation and operation, application, assembly, selection, and all various types of flexible couplings. *American Flexible Coupling Co.*

IT'S NEW ✓ CHECK IT

(22) AIR BALANCED PUMPING UNITS is the title of new, colorful, well illustrated bulletin available to the industry. Contains 16 pages of descriptive information, on-the-job photos, and many different styles of application on the latest models of air balanced pumping equipment. *Lacy Oil Tool Co.*

IT'S NEW ✓ CHECK IT

(23) STRAINERS AND SEPARATORS of all types and sizes are revealed to the industry in a multicolored brochure published by a large manufacturer of up-to-date steam line equipment. In this folder are described all types including dimensions, weights, pressures, construction, applications, and list prices. *American District Steam Co.*

IT'S NEW ✓ CHECK IT

(24) MAGNETIC FLOW GAGE which is unique in the fact that both sides of gage are visible when gaging flow, also operating by magnetism entirely, is non-rotating, glass windows are not under pressure, and operates readily on low pressures as well as high velocity pressures. Multicolored folder gives sizes and prices. *Ohio Pattern Works & Foundry Co.*

IT'S NEW ✓ CHECK IT

(25) MANUAL ON SALTS IN PETROLEUM is a revised edition of a booklet published some years ago which was then entitled "Determination of Salts in Crude Oils" and was popular with members of the oil industry. All material is based on extensive analytical work in the laboratory. *The Petroleum Rectifying Co.*

IT'S NEW ✓ CHECK IT

(26) ELECTROPUMPS is the title of a new eight-page bulletin describing a new line of centrifugal pumps ranging in capacity from 40 to 900 g.p.m. and heads up to 200 ft. or higher. Included in the bulletin are details of the hydraulic design which the manufacturer says results in higher pumping efficiency for all classes of general service. Electropumps are available with a choice of enclosures for hazardous locations. *The Carver Pump Co.*

IT'S NEW ✓ CHECK IT

(27) FULL PIPE-AREA lubricated plug valves are well covered in a colorful pamphlet compiled to give all necessary information on this particular type of pipeline equipment. Valves are made in semisteel, bronze and other metals and are used for acids, caustics, chemicals, oil, water, and other fluids. Also air, gases, and vacuums. *American Car & Foundry Co.*

IT'S NEW ✓ CHECK IT

The Oil and Gas Equipment Digest presents a review of what is new in equipment and trade literature . . . makes it possible for readers to obtain full information on every subject by use of convenient "Check It—Mail It" service card. This periodic feature of The Oil and Gas Journal will include all that is new in equipment . . . at a time when new products are being introduced, and existing products improved.

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The outstanding advantage of the DOUBLE E Multiple Step Tubing Catcher is that it protects the tubing without distorting the casing. This is accomplished by the multiple step design, which permits an extra large gripping surface, distributing the load over a much greater area than other catchers. Note the illustration at left. The simplicity of design and the heavily sectioned parts of this tubing catcher naturally are points of importance in providing long and economical life.

Tubing Catchers can be supplied with or without anchors. The anchors can be furnished for left-set or right-set, as desired.

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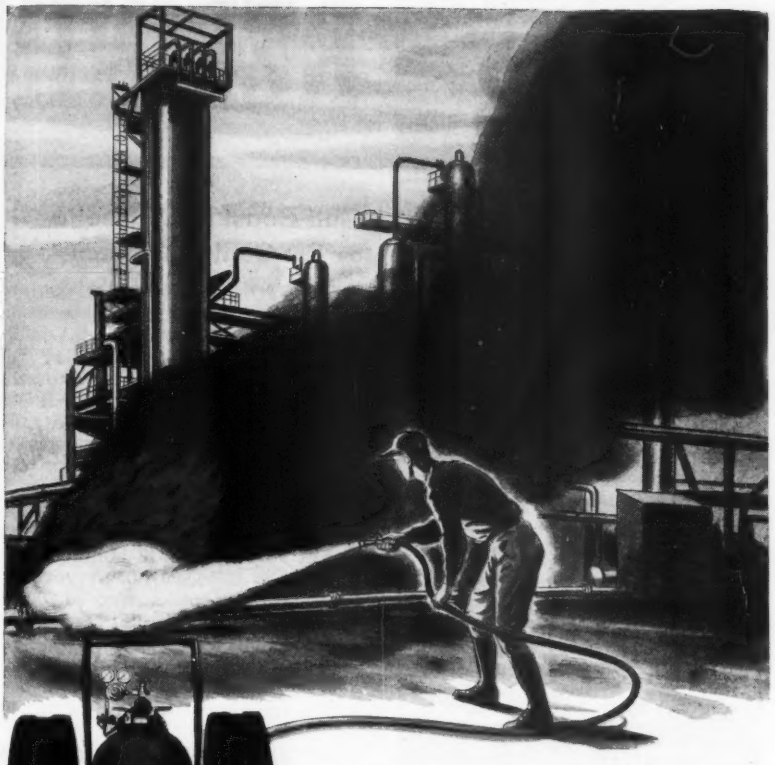

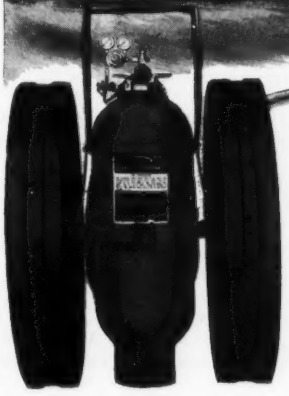

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● Upon striking fire, DUGAS Dry Chemical instantaneously releases 1100 times its volume in flame-smothering gas that chokes off fire in seconds. The swift, fire-stopping power of DUGAS Dry Chemical is unaffected by wind or draft. It is undiluted by passage through the air. The gas is released only in the immediate flame area.

Dangerously close approach to flames is eliminated because the stream of dry chemical is expelled under high pressure, permitting safer, longer range fire extinguishing operation.

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- Pump and Compressor Houses.
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Amazingly fast and effective, DUGAS Extinguishers provide more fire protection ... per pound ... per unit ... per dollar ... against all types of oil, gasoline, grease, paint, and electrical equipment fires. **And DUGAS Extinguishers Can be Recharged on the Spot.**

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Write today for further information including authoritative, impartial data showing characteristics of all types of approved fire extinguishers. The Ansul technical staff of fire protection engineers is ready to serve you.

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FIRE EXTINGUISHER DIVISION, MARINETTE, WISCONSIN

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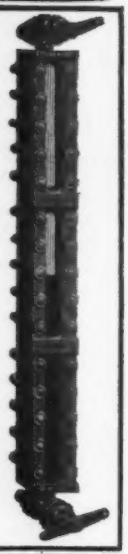
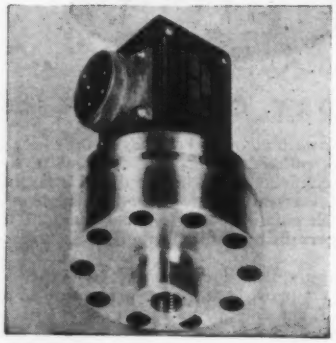
The "Reflex" is one of the complete line of Penberthy Gages that meet every liquid level gage requirement.



PENBERTHY INJECTOR CO.
DETROIT, MICH. Canadian Plant WINDSOR, ONTARIO

STATHAM
PRESSURE TRANSMITTER
MODEL P2



The simple means for electrical remote indicating or recording of gas or liquid pressure. Ranges: 0-60 psi. to 0-3000 psi. Natural Frequency: Above 1000 cps. Input requirements: Dry cells, AC, or carrier system. Output: Sufficient to operate a panel-type meter or a recording oscillograph, without amplification. Other models with ranges of 0-0.2 psi. to 0-10,000 psi. Types for gage, differential, or absolute measurements.

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REFINING

Gulf Coast Runs Rise to 94 Per Cent of Capacity

HOUSTON. — Gulf Coast Refiners Association reporting on operations of member company refineries on the Texas Gulf Coast for the last half of July indicates crude runs to stills totaling 149,970 bbl. daily, which is at the rate of 94 per cent of the rated 158,000 bbl. a day operating capacity. Runs the first half of the month were at 91 per cent of capacity.

Stocks of all grades of gasoline and naphthas decreased during the last half of July by 105,013 bbl. and were reported at 2,114,969 bbl. A year ago total gasoline stocks were 1,706,124 bbl. Automotive gasoline stocks considered alone were 1,398,985 bbl. August 1, a decrease of 108,488 bbl.

Kerosene stocks at 200,470 bbl. August 1, indicate a decrease of 155,495 bbl. Diesel gas-oil stocks August 1 were 224,159 bbl. reflecting an increase of 51,693 bbl. Stocks of other grades of gas oil increased 171,370 bbl. to 1,227,244 bbl. during the period. Stocks of No. 5 fuel oil decreased 85,749 bbl. to 379,812 bbl., and Bunker C fuel oil decreased 182,006 bbl. to 181,082 bbl. August 1.

Total stocks of all products were reported at 4,327,736 bbl. August 1, a decrease of 305,200 bbl. A year ago total products stocks were 3,642,190 bbl.

U. S. Appealing Decision on Jersey Standard Patents

WASHINGTON.—The Department of Justice announced last week the Government is appealing Federal Judge Charles E. Wyzanski, Jr.'s decision of July 8 ordering the Alien Property Custodian to return certain patents and other property to Standard Oil Co. (N. J.)

Notice of appeal was filed in New York City on the basis that patents and properties involved had been seized as enemy property; that transfers made by I. G. Farben-Industrie, German chemical trust, in 1939 or later were "sham" transactions.

Although Standard stated that it had purchased most of the property prior to the outbreak of war in Europe in 1939, and the rest after the war began, the Government seized the property on grounds that it was owned by Farben. Standard and three subsidiaries initiated suits in July 1944 for its return.

The patents and property include patents on the production of buna rubber, paraffin oxidation, a soap-manufacturing process, and the acetylene-arc process used in producing butadiene, a basic buna-rubber ingredient.

Slight Drop Reported in Bright Stock Inventories

Thirteen companies manufacturing lubricating oil in the Mid-Continent area reported 22 days' supply of bright stock as of June 30, compared to 23 days' supply May 31, and 33 days at the end of April, according to the monthly summary of Western Petroleum Refiners Association.

Production of bright stock totaled 227,731,000 bbl. during June, up 2 per cent over the 223,319 bbl. produced in May. April production was 233,703 bbl. Domestic and export shipments continued down through June. Shipments for the month totaled 237,094 bbl., a decrease of 55,816 bbl., or 19.1 per cent under the previous month's shipments. April and May shipments

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were 326,570 bbl., and 292,910 bbl.

Production of viscous neutrals of 341,217 bbl. in June increased slightly over May's 340,867 bbl., but was 3.7 per cent under April production of 354,271 bbl. Total shipments of viscous neutrals, domestic and export, decreased 28,487 bbl., or 8.3 per cent, under the total of 342,009 bbl. in May. April shipments totaled 360,421 bbl.

Production of paraffin oils, steam refined stock and blended oils during June was 66,910 bbl., 24,190 bbl., and 333,864 bbl., respectively; in the same order, May production was 71,451 bbl., 32,019 bbl., and 352,469 bbl. Shipments of paraffin oils, steam refined and blended oils in June were 63,973 bbl., 23,717 bbl., and 359,637 bbl., compared with 71,982 bbl., 21,640 bbl., and 363,733 bbl. the previous month.

Indiana Standard's New Lubricant to Be Marketed

CHICAGO.—Dr. Robert E. Wilson, chairman of the board of Standard Oil Co. (Ind.), at a special gathering last week of trade and technical press correspondents, announced the company's new motor lubricant, Permalube, developed for and utilized by the armed forces during the war, would soon be placed on the market.

The new oil is a highly refined product, plus certain patented additives adding to its life and usefulness, according to the announcement. Claims made for the new oil include a special capacity to protect against varnish deposits on pistons, cylinders and other engine parts; against sludge deposits and sticking of rings, and against deterioration or breakdown of the oil itself.

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Petroleum Patents Added To Washington Register

WASHINGTON. — Petrolite Corp., Webster Groves, Mo., has placed 408 patents on the Register of Patents for licensing or sale maintained by the Patent Office, according to the Department of Commerce.

Patents listed by the corporation include 362 relating to the chemical treatment of petroleum oils and 82 on the electrical dehydration or desalting of oils. By its action Petrolite has given public notice that the patents are available for use by other firms or individuals on license terms to be arranged.

Oil Shale Plants to Reach Capacity by Fall

WASHINGTON. — Three oil - shale and coal laboratories and demonstration plants directed by the fuels and explosive divisions of the Bureau of Mines will be operating at full planned capacity by early fall, Dr. W. C. Schroeder, chief of synthetic fuels for the bureau, announced last week.

The laboratory under construction at Bruceton, Pa., for coal research has an approximate capacity of 100 bbl. of synthetic fuel a day. An oil-shale laboratory is being built at Laramie, Wyo. The oil-shale demonstration plant at Rifle, Colo., will be producing 50 bbl. a day by the year's end and will be increased to 200 bbl. in 1947.

With an estimated oil reserve in the United States from shale deposits of 92,000,000,000 bbl. and the fact that oil shale is found in outcroppings through evident seams, there is no need for expensive exploration. At present, as compared with current market prices of $1.50 a barrel for crude petroleum, shale oil can be produced at a cost of from $1.75 to $2.25 a barrel, Dr. Schroeder said.

Pennsylvania Plant to Close

CORAOPOLIS, Pa. — Inability to obtain a sufficient supply of Pennsylvania crude oil has led to a decision to close Canfield Oil Co.'s refinery here August 15, A. L. Bailey, president of the company, announced last week. The plant has a capacity of 1,000 bbl. daily. Compounding and shipping operations at Coraopolis, however, will continue, Bailey said.

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Heavy duty, ruggedly constructed and extremely simple in design . . . Gets quick, accurate results . . . produces required speed with less effort . . . Cranks and heads of 100 CC and 15 CC size machines interchangeable . . . Meets *A.S.T.M. Standard Method D-96* and *A. P. I. Code No. 25* requirements.

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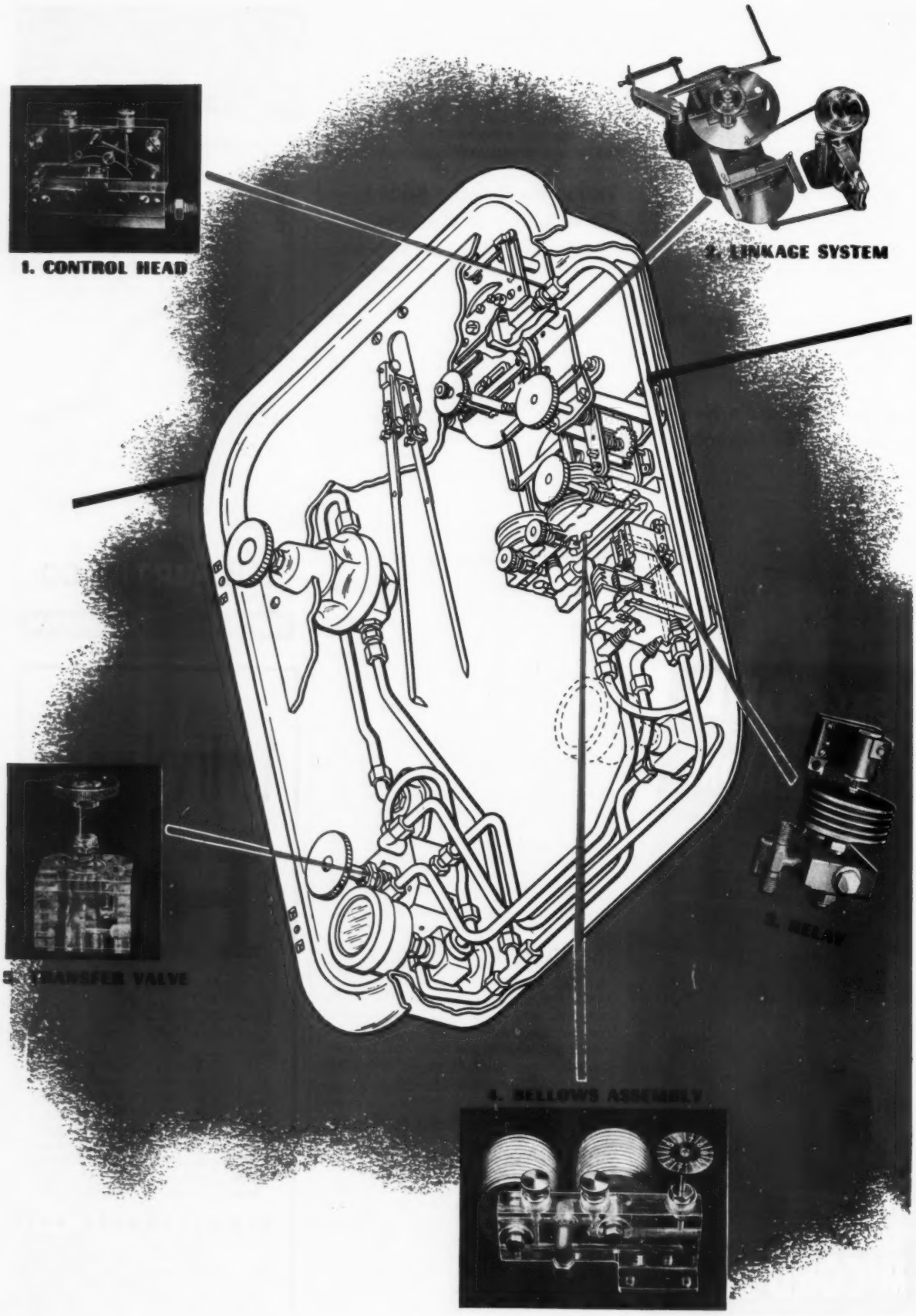
1. CONTROL HEAD
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4. BELLOWS ASSEMBLY
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PIPE LINES

Sinclair to Build Line From Corpus Christi

NEW YORK. — Sinclair Oil Corp. will build a new products line from Corpus Christi, Tex., to Austin and San Antonio as a part of the general postwar expansion of its pipe-line system.

The disclosure that the line will be built was made in Sinclair's semiannual statement. When the over-all program is completed, the Sinclair system will extend from the Gulf of Mexico, and from Wyoming through Kansas City to Chicago and Milwaukee on the Great Lakes, and eastward to the Atlantic Ocean. One of Sinclair's refineries is its 27,000-bbl. daily crude capacity plant at Corpus Christi.

The completed system will connect five of the company's largest refineries, greatly reduce transportation costs, and contribute to future earnings, said H. F. Sinclair, president. The extensive pipe-line construction under way was signalized this month by the completion of the Chicago-Toledo line to Detroit, with rapid progress being made on the line from Toledo to Columbus, Ohio.

The general modernization and expansion program is proceeding as rapidly as deliveries of materials will permit, Sinclair said.

First Deliveries Set for Humble's New Products Line

BAYTOWN, Tex.—First deliveries into the Humble Pipe Line Co.'s new 8-in. products line, extending 276 miles from Humble Oil & Refining Co.'s Baytown refinery to the Dallas-Fort Worth area were scheduled to commence early this week at the Baytown terminal.

Construction of the Baytown-Hearne section was being completed early this week, and all of the pipe for the Hearne - Dallas section has been laid. When placed in operation, the new $4,000,000 line built all of new steel pipe and with a daily capacity of about 15,000 bbl., will supply gasoline and other products to the agricultural and industrial area of North Texas.

The coating and wrapping machine used on the northern section of the line offered something new in pipeline construction. It was, in effect, a double-wrap machine. In sequence, it applied in one continuous operation: a coat of molten enamel on previously cleaned and primed pipe, followed by a spiral wrap of light Fiberglas, then another coating of enamel, followed by a spiral wrap of asbestos felt.

It is anticipated that the Fiberglas, by providing definite reinforcement and by making possible the application of a thicker enamel coating, will increase protection against corrosion and reduce maintenance problems.

Pipe for the southern section was coated and wrapper in identical fashion, except that the work was done in a centrally located yard before pieces of pipe were strung along the line.

Welders and a pressure test crew preceded the coating and wrapping machine. After segments of line were welded, scrapers were put through by compressed air. Then the segment was closed, air pressure was built up to 100 psi., and welds were tested for leaks. These tests were made at intervals not to exceed 2½ miles. Later sections of completed line between block valves were closed, filled with

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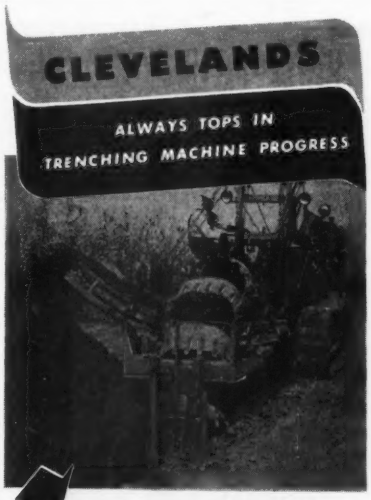

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PENBERTHY
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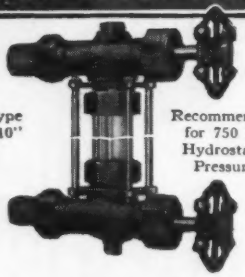

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Recommended for 750 lb. Hydrostatic Pressure

Steel construction throughout with stainless steel interior trim. Automatic shut-off is positive and instantaneous; stainless steel balls shut off the flow of liquid when glass breaks. Heavy duty stuffing boxes, union connections, offset construction facilitate cleaning and simplify glass replacement. Conform with A.P.I.—A.S.M.E. requirements.

This is one of the complete line of Penberthy gages that meet every liquid level gage requirement.

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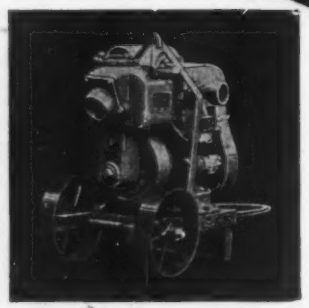
PIPE LINE SUPPLIES AND EQUIPMENT



GORMAN-RUPP PUMPS

There's a model for every pumping requirement . . . for pumping from 5 to 2100 gallons per minute. The most dependable pump for the least money.

The Clarence L. Boyd Co., Inc.
Phone 8191 LD 745
Tulsa, Oklahoma

gasoline, and subjected to a 1,500 psi. hydrostatic-pressure test.

Complete cathodic protection has been given against corrosion, and electrical connections for this purpose have been provided at ½-mile intervals. Great care was taken to keep the line clean during construction. Each piece was capped until shortly before welding.

Pumping stations will be at Baytown and Hearne, with delivery terminals provided at Houston, Hearne, Waco, and Dallas. Multi-stage, electrically driven, centrifugal pumps will be installed at both pump stations.

Work to Start Soon on New 103-Mile Pasotex Line

HOUSTON.—Pasotex Pipe Line Co. this week announced plans for the construction of a new 103-mile, 10¾-in. line from the Yates field in Pecos County, Texas, to the company's terminal in the Hendricks pool of Winkler County. Survey for the right-of-way is now being made, and work will get under way as soon as possible, according to A. J. Cunningham, Pasotex official.

The new line will have a maximum working pressure of 1,200 psi., with a rated capacity of 20,000 bbl. per day. Of this amount, it is expected that some 10,000 bbl. per day will be gathered and purchased in the Yates pool. Storage facilities at the Yates terminal will permit receiving purchased oil currently. Positive piston-type displacement pumps will be installed at the Yates terminal to transport oil without the use of intermediate booster stations.

The company's present line extends from the terminal in Winkler County to the refinery of Standard Oil Co. of Texas at El Paso, Tex., which is currently carrying some 21,000 bbl. per day. Pasotex expects to construct living facilities for its personnel at the Yates pool terminal.

Propane Plant, New 20-In. Gas Pipe Line Planned

BRADFORD, Pa.—Plans for a propane-vaporizing plant near Bradford, and a new 20-in. natural-gas pipe line between Wheeling, W. Va., and Rochester, Pa., were announced recently by Manufacturers Light & Heat Co.

The propane plant is a unit for transforming liquid propane into a vapor phase. The gas is then mixed with natural gas to augment the supply, according to K. C. Wilson, of Olean, N. Y., district manager.

"Contractors have inspected the route of the new gas-transmission line and construction should start immediately after final approval has been received from the Federal Power Commission," Wilson said.

FPC Upholds Reynosa Pipe Line Export Order

WASHINGTON. — Federal Power Commission last week denied a petition to set aside Reynosa Pipeline Co.'s permit to export natural gas to Mexico, via a proposed 170-mile pipe line from Hidalgo County, Texas, to Monterrey, Mexico. The petition was filed by the Mexican Gas Co. and the Texas Railroad Commission.

Reynosa Pipeline, a Texas corporation, was authorized by FPC in June of this year to export up to 50,000,000 cu. ft. of natural gas per day to Gas Industrial de Monterrey, S.A., a Mexican corporation. The authorization was contingent upon filing of an application with the commission for permission to construct approximately 30 miles of pipe line from La Blanca, South Weslaco and Santa Maria fields in Hidalgo County, to the Mexican border. From the international bridge at Hidalgo-Reynosa, it would join the 140-mile Mexican line to Monterrey.

Another order by FPC last week postponed the hearing for Panhandle Eastern Pipeline Co. from August 26 to September 30 for reconsideration of an FPC order of March 14. That order dismissed without prejudice a Panhandle application to serve natural gas to the Ford Motor Co. at Dearborn, Mich.

Atlantic Pipe Line Asks Bids on West Texas Line

Atlantic Pipe Line Co. has issued specifications and asked for bids from contractors for the construction of 50 miles of 8-in. crude oil line from Crane County, Texas, to the company's Midland, Tex., terminal.

Work is scheduled for the last quarter of this year. Atlantic is contemplating building an entirely new 10-in. line from West Texas to the Gulf Coast in the 1947-48 period.

C. S. FOREMAN COMPANY

General Contractors

PIPE LINES

217 Railway Exchange Building
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NATURAL GAS

Industry's Slow Recovery Retards Industrial Gas Use

NEW YORK.—Sales of gas by utility companies for residential and commercial use increased in June, the American Gas Association reported this week. However, declines in sales of industrial gas through the continuing inability of industry to attain its wartime production rate, offset residential and commercial sales so that total sales of gas utility companies for June amounted to 1,942,000,000 therms, a decrease of about 4.4 per cent from sales for June 1945.

The association is now developing separate information pertaining to mixed gas, comprised of mixtures of manufactured and natural gases. These data were formerly included either in the manufactured or the natural gas series, depending upon the heat content of the gas.

Under the new classification, utility sales of natural gas to ultimate consumers in June amounted to 1,697,000,000 therms, a decrease of approximately 4.9 per cent. The association's index of June natural gas sales stood at 192 per cent of the 1935-1939 average. For the 12 months ended June 30, 1946, total sales of natural gas declined to about 2.1 per cent under those for the previous 12 months.

One therm is equivalent to about 190 cu. ft. of manufactured gas, 120 cu. ft. of mixed gas, and 95 cu. ft. of natural gas.

Record Attendance Due at A.G.A. Annual Convention

NEW YORK.—With 3,000 registrations already received, officials of the American Gas Association are making preparations for a record attendance at the annual convention October 7-10 in Atlantic City, N. J.

Indications point to a total attendance of some 10,000. Everett J. Boothby, A.G.A. president, is urging all members of the association to make hotel reservations early to be assured of accommodations.

On Monday morning, the natural gas department will meet in the Claridge Hotel, and the manufactured gas department in the Traymore Hotel. An employe relations forum will be held in the auditorium in the afternoon. General sessions will be held in the auditorium Tuesday and Thursday mornings with another general session including entertainment features and the presentation of general awards, set for Wednesday evening.

Various other sections and committees of the association—technical, accounting, residential gas, industrial and commercial gas—will meet during the week. Friday is set aside for miscellaneous meetings. Chairman of the convention committee is Irving K. Peck, vice president and general manager of the Manufacturers Light & Heat Co.

The association said thus far 112 exhibitors have taken 63,000 sq. ft. of space in the convention exhibit of gas appliances and equipment.

Agreement Made for Gas From Alberta Field

EDMONTON, Alta. — Negotiations in progress for some time have resulted in a tentative franchise agreement between a group headed by Charles H. Withers and W. F. Thorn and the Athabaska Municipal Council.

The Withers-Thorn group have arranged with Deca Syndicate of Calgary, Alta., to handle the gas production of two of the syndicate's wells in the Athabaska field, and are planning to pipe the gas to Athabaska and provide distribution. The agreement, still to be approved by the Alberta Public Utilities Commission and the ratepayers of the town, calls for a 20-year franchise. It is planned to deliver gas by December 1, if material can be obtained.

Gas Technology Course Committee Announced

KINGSVILLE, Tex.—The administrative committee for the gas-technology course scheduled by Texas College of Arts and Industries for August 27, 28, and 29 has been announced.

Dr. Frank H. Dotterweich will be chairman of the committee, with members including Dr. W. G. Hugly, Larry F. Ladewig, Elton Sterrett, and Robert R. Suttle. Members of the college staff who will serve as instructors are Noel C. McGuire, Emerson Korgas, Durward Emery, and Alfred Lehmberg. The course, sponsored by the Southern Gas Association, will take up transmission problems, air conditioning, and food dehydration as applied to natural gas.

Natural Gasoline

Warren Completes One Plant, Converts Another

CONSTRUCTION of a natural-gasoline plant near Holliday, Tex., whose operating design departs radically from the conventional type, and the manufacturing and marketing of special light hydrocarbon fractions at a plant of an affiliated company near Hawkins, Tex., were announced recently by Warren Petroleum Corp.

Features of the new natural-gasoline plant, which processes gas from the Hull-Silk, Daume, and East Holliday fields of North Texas are: elimination of steam boilers and the use of steam in the plant; utilization of air for at least 80 per cent of the required cooling; use of direct gas-fired tube still in the distillation unit; operation of the reboilers of the fractionating unit with heat from the hot lean oil from the distillation unit; and utilization of the heat from the lean hot oil for all other heating requirements, including the plant buildings.

The plant is capable of a raw intake of 15,000,000 cu. ft. of gas daily, with a production of 40,000 gal. daily of 26-lb. natural gasoline and 24,000 gal. daily of liquefied petroleum gases of butane-propane mixtures.

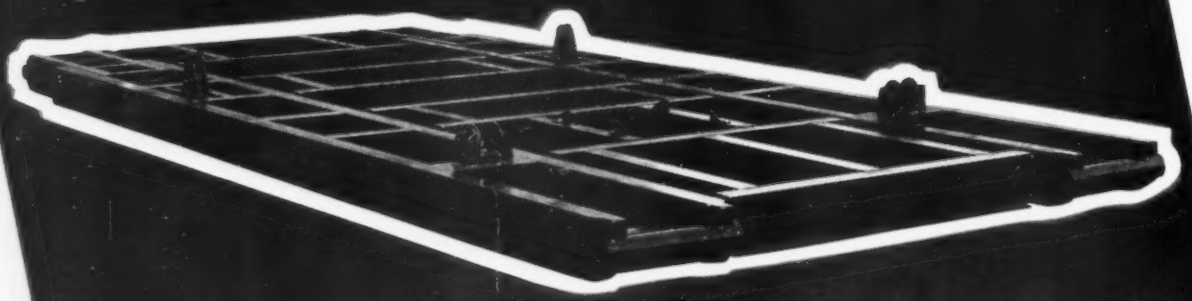
Contracts already have been signed for the plant to provide repressuring for the two producing zones in both Daume and East Holliday fields. A survey is now under way to determine the feasibility of repressuring the two zones in Hull-Silk pool. It is estimated that about 40 per cent of the raw-gas intake will be utilized in lease and plant operations, leaving the balance available for return to leases for repressuring and other disposal.

Location of the plant is on a 22-acre tract about 3½ miles from Holliday and some 18 miles from Wichita Falls. The plant was constructed by J. F. Pritchard & Co., Kansas City, Mo.

The manufacture of commercial hexane, commercial heptane and heavy solvent naphtha represents a new postwar activity by Warren. The plant at Hawkins is owned jointly by Natural Gasoline Corp. and Humble Oil & Refining Co., with Warren responsible for the marketing of the plant's products.

Warren is installing additional equipment at its Crossville, Ill., plant for the manufacture of these special hydrocarbons. Four columns are to be added, with installation scheduled for completion in the next 45 days.

Moore BASES



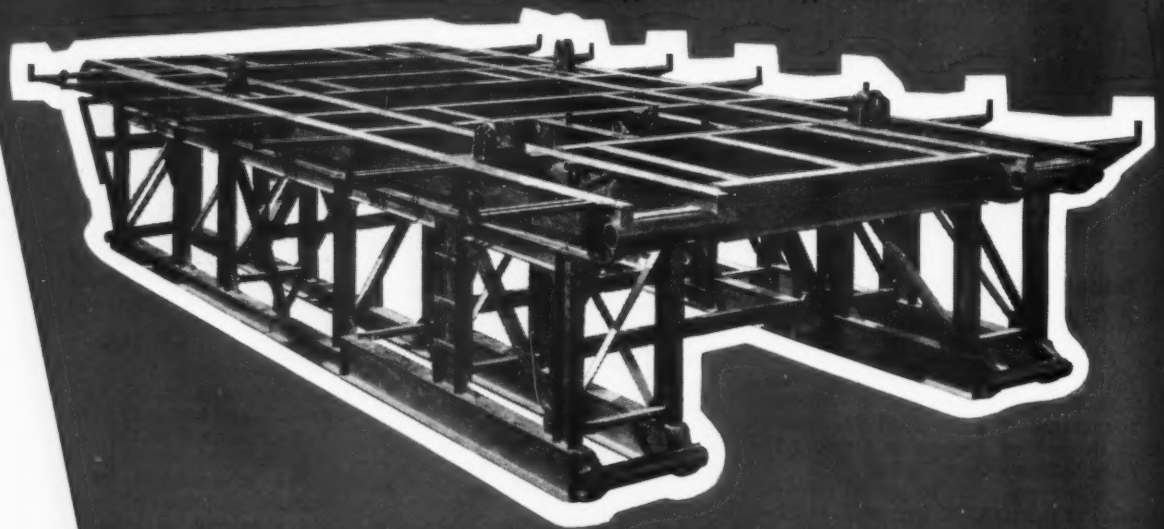
SKID BASES

Moore adjustable skid bases serve as a support for flooring, draw works, rotary table and engines.

The base is broken-down into convenient welded sections of proper size for highway clearance and are readily assembled by means of drive pins.

This base supports the mast shoes and distributes the erection and drilling loads so that the entire unit can be mounted on any flat surface.

The patented adjustable feature permits the length of the base to be adjusted to accommodate different rigs. Available in Long Type and Short Type bases.



SUB-BASES

The sub-bases for Moore Masts provide a means of elevating the mast base to give the required clearance for well head connections.

Heights vary by 1'-0" from 3'-8" to 7'-8". Available in two lengths to suit either the short type or long type skid bases.

The capacities of these bases are comparable to standard drilling sub-structures; yet can be broken down into units which can be carried on a truck without exceeding highway clearance.

Where short location moves are involved the skid base or sub-base can be used to skid the rig from one location to another.

S for Drilling Masts

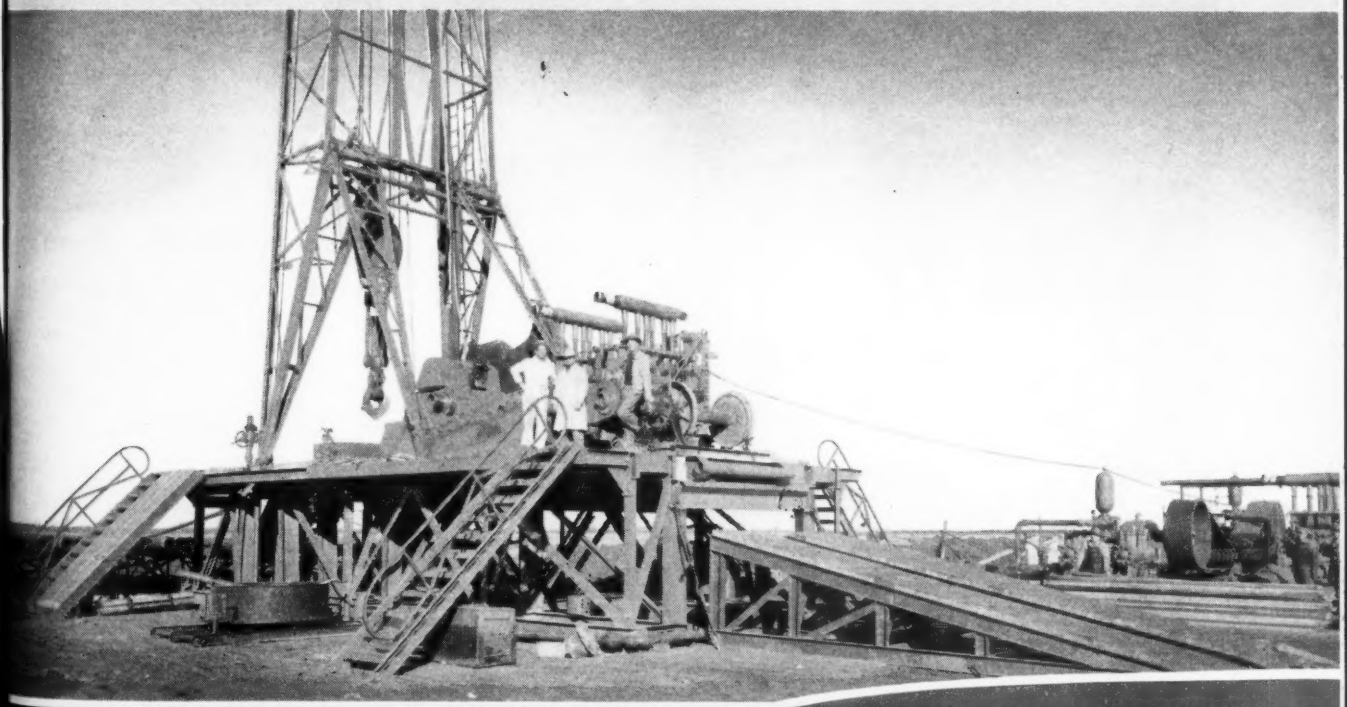
All Moore auxiliary equipment is built to effect a more sturdy, safer, faster and efficient drilling unit.

The components of the Jackknife mast; the bases, stairways, truck ramps and pipe rack-ramp sections are all designed for ease in transportation and speedy assembly.

Auxiliary units are standard production models more economical to buy and use, and more quickly available.

The pioneer engineering done by Moore in developing the Jackknife Mast and its various auxiliary equipment has been of such basic design that patents have been issued on many features of construction. The advantages of Moore equipment is best emphasized by the acceptance of this equipment by the petroleum industry throughout the world.

There is a Moore drilling structure that is particularly adaptable to any drilling project. Moore Service is available from strategically located field stores throughout the country.



...Jackknife Mast, with ... base, sub-base, ad-...ble stairs and truck

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STATISTICS and T

WEEKLY WELL COMPLETIONS . . . WEEK ENDED AUGUST 10, 1946

	Total of all wells					Cum.		Wildcat completions and discoveries					Cumulative total, 1946				
	Comp.	Oil	Gas	Dry	Footage	1946	1945	Oil	Dist.	Gas	Dry	Total	Oil	Dist.	Gas	Dry	Total
New York	31	16	0	*15	117,936	955	857	0	0	0	0	0	0	0	0	0	0
Pennsylvania	72	41	2	†29	108,123	2,411	2,482	0	0	0	0	0	0	0	0	0	0
West Virginia	16	1	14	1	48,443	429	494	0	0	0	0	0	0	0	0	0	0
Ohio	15	6	3	6	39,860	722	558	0	0	0	1	1	2	0	10	23	35
Indiana	8	5	0	3	15,487	216	119	0	0	0	0	0	2	0	0	11	13
Kentucky	7	1	1	5	14,959	297	302	0	0	0	3	3	2	0	0	23	25
Illinois	41	24	0	17	98,199	1,324	1,052	2	0	0	9	11	26	0	0	245	271
Michigan	12	4	1	7	32,840	481	466	0	0	0	6	6	17	0	5	160	182
Kansas	36	19	5	12	117,597	1,188	1,019	0	0	1	6	7	17	0	1	152	170
Neb., Mo., Iowa	1	0	0	1	4,561	12	13	0	0	0	1	1	0	0	0	8	8
Oklahoma	64	33	8	23	214,341	1,568	1,469	4	0	1	7	12	52	0	27	190	269
Texas	163	100	9	54	659,404	4,847	4,394	3	2	1	20	26	118	21	18	772	929
North Central	77	42	0	‡35	194,040	1,766	1,317	2	0	0	11	13	35	0	2	321	358
West	34	29	0	5	178,768	1,031	1,127	0	0	0	2	2	30	0	1	105	136
Panhandle	9	7	2	0	26,733	204	347	0	0	0	0	0	0	0	0	5	5
Eastern	13	5	5	3	67,172	430	198	0	0	0	2	2	10	0	1	55	66
Gulf Coast	22	14	1	7	160,899	1,055	992	1	2	0	3	6	28	19	7	152	206
Southwest	8	3	1	4	31,792	361	413	0	0	1	2	3	15	2	7	134	158
Louisiana	37	19	3	15	233,638	802	621	3	0	2	5	10	36	6	6	107	155
Northern	21	12	2	7	96,774	440	228	2	0	1	5	8	8	0	1	59	68
Southern	16	7	1	8	136,864	362	393	1	0	1	0	2	28	6	5	48	87
Arkansas	4	2	0	2	13,757	109	107	1	0	0	2	3	5	0	0	25	30
Mississippi	2	1	0	1	16,321	149	218	0	0	0	1	1	1	0	1	41	43
Southeastern States	1	0	0	1	3,845	27	38	0	0	0	1	1	1	0	0	22	23
Montana	8	4	3	1	15,783	185	189	0	0	0	1	1	9	0	1	22	32
Wyoming	3	2	0	1	17,131	101	124	0	0	0	1	1	10	0	3	26	39
Colorado-Utah	5	4	0	1	32,012	85	22	0	0	0	1	1	4	0	0	11	15
New Mexico	3	3	0	0	14,857	219	270	0	0	0	0	0	3	0	3	24	27
California	18	14	1	3	81,197	1,076	1,438	1	0	0	3	4	7	0	3	137	147
Total United States	547	299	50	198	1,900,291	17,203	16,252	14	2	5	68	89	312	27	75	1,999	2,413
Total previous week	551	279	69	203	1,796,158	16,656	15,674	16	1	1	67	85	298	25	70	1,931	2,324
Total Aug. 11, 1945	578	326	42	210	1,922,624			6	0	2	80	88	319	17	85	2,096	2,517

Service wells included: *15, †29, ‡1.

MARKET QUOTATIONS

GRAVITY SCHEDULES

Top prices include all gravities above grades designated, and low prices include all gravities below grades designated:

Gravity—	Signal Hill, Calif.	Oklahoma, Kansas	Gulf Coast Texas	West Tex.*
18-18.9	$1.17	....	....	....
19-19.9	1.21	....	$1.41	$1.05
20-20.9	1.24	$1.20	1.43	1.07
21-21.9	1.28	1.22	1.45	1.09
22-22.9	1.32	1.24	1.47	1.11
23-23.9	1.35	1.26	1.49	1.13
24-24.9	1.39	1.28	1.51	1.15
25-25.9	1.43	1.30	1.53	1.17
26-26.9	1.46	1.32	1.55	1.19
27-27.9	1.50	1.34	1.57	1.21
28-28.9	1.54	1.36	1.59	1.23
29-29.9	1.57	1.38	1.61	1.25
30-30.9	1.61	1.40	1.63	1.27
31-31.9	....	1.42	1.65	1.29
32-32.9	....	1.44	1.67	1.31
33-33.9	....	1.46	1.69	1.33
34-34.9	....	1.48	1.71	1.35
35-35.9	....	1.50	1.73	1.37
36-36.9	....	1.52	1.75	1.39
37-37.9	....	1.54	1.77	1.41
38-38.9	....	1.56	1.79	1.43
39-39.9	....	1.58	1.81	1.45
40 and above	....	1.60	1.83	1.47

*Includes Lea County, New Mexico.

(Quotations shown here are f.o.b. plant in tank cars and in cents per gal. as of last Monday. Crude prices reflect latest 25-cent advance except in California and Pennsylvania where no increase had been made as of Monday morning, July 29.)

REFINERY GASOLINE

Octane (A.S.T.M.)	78-78½†	73-75
Mid-Continent*	7.750	6.750-7.000
Tex. Gulf Coast	7.250	6.500-6.750
New York Harbor	8.600	7.700
California		7.000-7.875

*Basic Oklahoma Group 3. †1939 C.F. R. (research method).

NATURAL GASOLINE

Grades—	26-70	18-55
Oklahoma (Group 3)	4.250	5.100
N. Texas (f.o.b. plant)	3.750	4.500
N. Louisiana (f.o.b. plant)	4.000	4.800
California	5.875	6.500

CRUDE-OIL PRICES

Representative posted schedules per bbl.

East Texas	$1.60
Kettleman Hills, California*	1.69
Beauregard Parish	1.55
Illinois Basin	1.72
Pecos County, Texas	1.30
Bradford, Pennsylvania	3.35
Eastern Ill., and Western Ind.	1.57

Note: Exclusive of subsidy.
*For 37-37.9 gravity.

A.P.I. REFINERY REPORT

Week ended August 3, 1946
(Figures in thousands of barrels)

	Dly. crude runs to stills	Stocks—Gasoline	Distillate	Residual
East Coast	754	22,507	14,539	9,559
Appalachian	151	3,238	559	403
Ill., Ind., Ky.	827	16,004	6,809	4,601
Okla., Kan., Mo.	382	7,669	2,941	1,402
Inland Tex.	215	2,625	477	783
Tex. Gulf Cst.	1,197	13,441	7,069	4,813
La. Gulf Cst.	337	4,004	2,465	1,564
N. La., Ark.	57	1,819	489	141
Rocky Mt.	131	1,594	490	816
California	798	13,955	9,832	26,056
Total 8- 3-46	4,849	86,856	45,670	50,138
Total 7-27-46	4,896	88,626	44,316	49,517
Total 8- 4-45	5,070	85,018	36,581	43,337

CRUDE-OIL STOCKS

(Bureau of Mines Estimate)

Week ended:	Bbl. of crude*
August 3, 1946	224,832,000
July 27, 1946	223,756,000
August 4, 1945	215,382,000

*Excludes unrefinable Calif. stocks.

TRENDS

DAILY AVERAGE PRODUCTION FOR WEEK

	Aug. 10 crude oil	B. of M. Aug. demand	Aug. 3 crude oil
Alabama	1,100	2,000	1,200
Arkansas	78,950	78,000	78,950
California	876,150	850,000	877,500
Colorado	33,520	30,000	32,450
Eastern	66,500	64,000	61,950
Florida	150	200	200
Illinois	210,200	215,000	210,000
Indiana	17,700	19,000	18,300
Kansas	260,950	260,000	264,150
Kentucky	31,000	31,000	30,850
Louisiana	394,850	380,000	392,300
North Louisiana	91,050	.....	91,000
South Louisiana	303,800	.....	301,300
Michigan	45,800	47,000	45,700
Mississippi	68,600	60,000	62,750
Montana	25,100	24,000	25,800
Nebraska	750	800	750
New Mexico	100,850	99,000	100,850
Oklahoma	382,500	384,000	381,100
Texas	2,119,800	2,120,000	2,196,250
District 1 (Southwest)	19,500	.....	19,500
District 2 (Southwest)	155,100	.....	157,150
District 4 (Southwest)	224,300	.....	226,900
District 3 (Gulf Coast)	486,550	.....	504,100
District 5 (Eastern)	43,050	.....	43,800
District 6 (Eastern)	105,650	.....	107,150
East Texas Field	317,000	.....	315,600
District 7C (West)	27,900	.....	28,100
District 8 (West)	490,600	.....	546,700
District 7B (W. Central)	32,650	.....	32,100
District 9 (N. Central)	132,700	.....	130,100
District 10 (Panhandle)	84,800	.....	85,050
Wyoming	109,250	110,000	110,950
Total United States	*4,823,720	4,774,000	4,892,000

Change from prev. wk., down 68,280

Corrected production January 1-August 3 ..... 1,014,664,459 bbl.
Total production January 1-August 10 ..... †1,048,578,899 bbl.
Same period last year (crude, plus condensate) 1,070,069,400 bbl.
*Not incl. 21,200 bbl. condensate. †Incl. 5,507,200 bbl. condensate.

CRUDE-OIL STOCKS 224,832,000 bbl. as of August 3—up 1,076,000 bbl. One year ago 215,382,000 bbl.

GASOLINE STOCKS 86,856,000 bbl. as of August 3—down 1,770,000 bbl. One year ago 85,018,000 bbl.

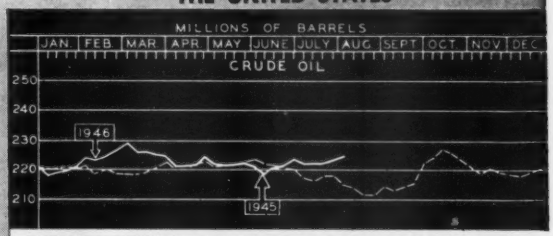
RESIDUAL FUEL-OIL STOCKS 50,138,000 bbl. as of August 3—up 621,000 bbl. One year ago 43,337,000 bbl.

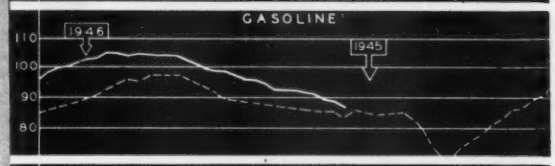
GAS OIL AND DISTILLATE STOCKS 45,670,000 bbl. as of August 3—up 1,354,000 bbl. One year ago 36,581,000 bbl.

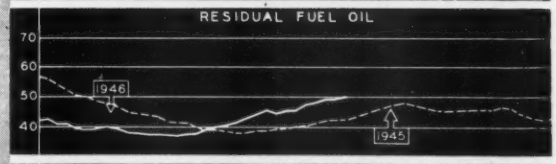
CRUDE-OIL PRODUCTION 4,823,720 bbl. as of August 10—down 68,280 bbl. One year ago 4,933,600 bbl.

REFINERY RUNS 4,849,000 bbl. daily week ended August 3—down 47,000 bbl. One year ago 5,070,000 bbl.

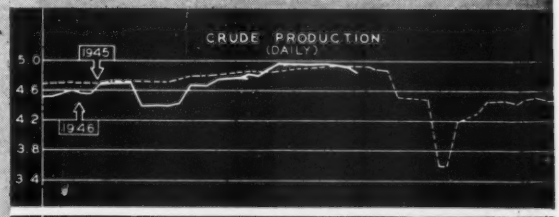
OIL STOCKS IN THE UNITED STATES

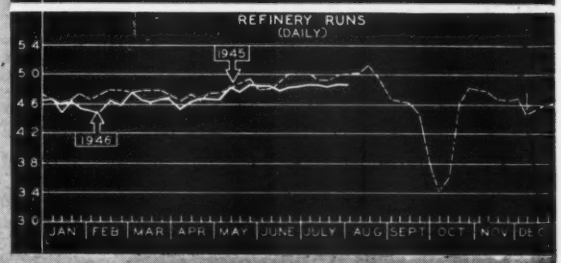






DAILY OPERATIONS





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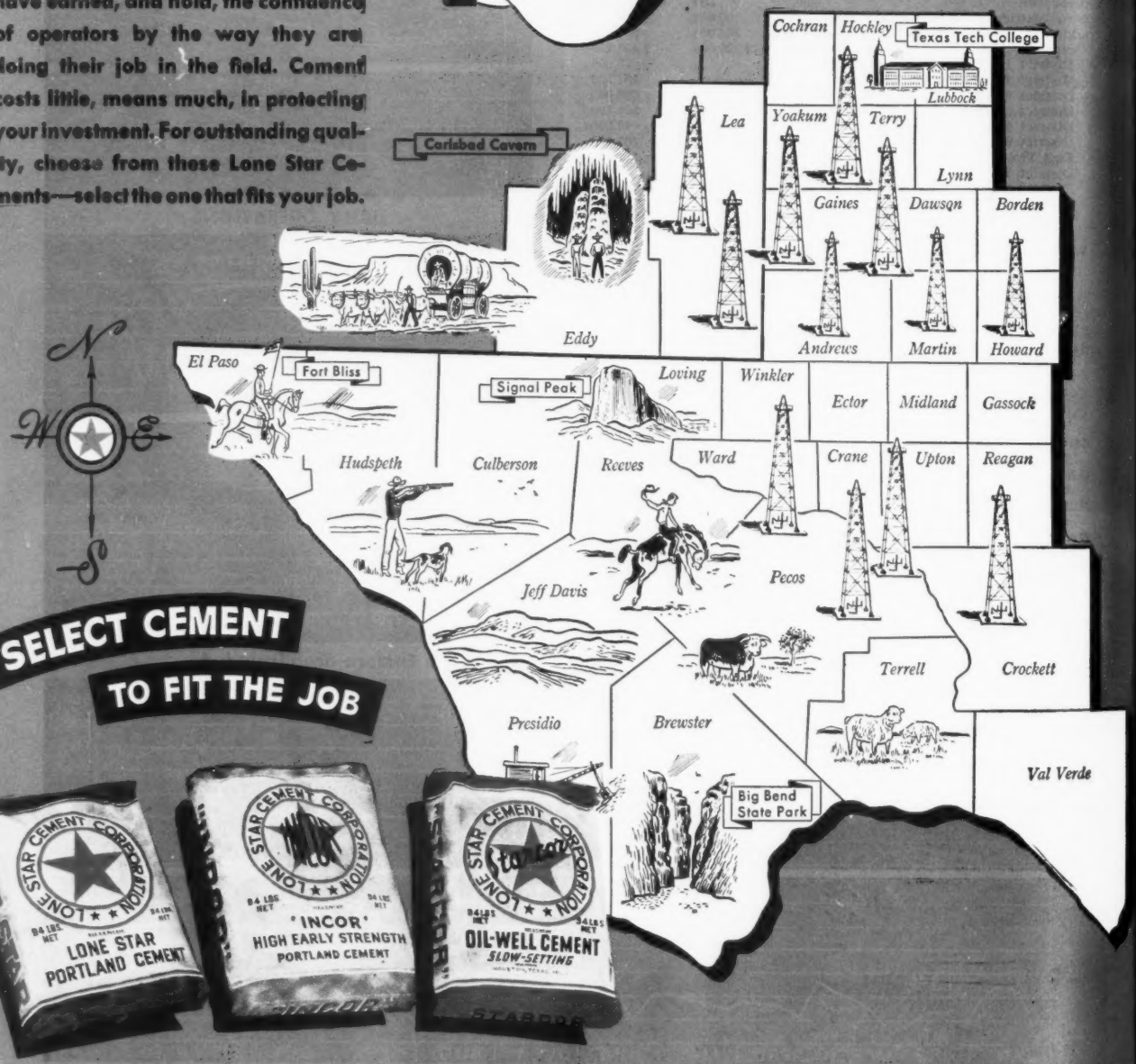

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Exploration and Drilling

Arkansas Discovery Looks Good

PERFORMANCE of the discovery well in the new Spirit Lake pool in southwestern Arkansas brings encouragement to the wildcatters in that area, after a not-too-good year thus far. The new pool, opened by Austin Stewart's 1 Moore Estate, NW SE 14-16s-25w, is another of the fault-line pools, and is about halfway between the Fouke and Midway fields. Reports are that it looks better in the Glen Rose than the first Fouke well, having a thicker and more porous pay.

With an elevation of 232 ft., electric-log tops reported are Midway —814 ft.; Arkadelphia —1,478 ft.; Nacatoch —1,659 ft.; Fault at —2,028 ft., probably 80 ft. out; Saratoga —2,064 ft.; Base Annona —2,413 ft.; Buckrange Sand —2,522 ft.; Fault at —2,678 ft., probably 120 ft. out; Tokio —2,696; Tokio Sand —2,698 to —2,738 ft., with fault at base, probably 450 ft. out; Paluxy (not the top) —2,744 ft.; Glen Rose —3,412 ft.; Fault (?) —3,438 ft., 86 ft. out (?); Top Massive Anhydrite —3,705 ft.; Base —3,868 ft.; Base of Stringer —3,946 ft.

The well was completed in the Kilpatrick zone of the Glen Rose. First perforations were at 4,142-50 ft., with 45 shots, followed by drill-stem test which netted a small amount of oil flowing by heads. Without squeezing, the well was then perforated at 4,108-18 ft. with 60 shots. On test it gaged 248 bbl. of oil per day through a 1/16-in. tubing choke, showing tubing pressure of 440 psi., casing pressure of 575 psi. Oil is 36.5° gravity.

The core record and electric log indicate that possibly two good pays will produce in the shallower Paluxy, and acreage holders in the vicinity are already talking spacing for the Paluxy wells. The Glen Rose will be on regular 40-acre spacing, but the Paluxy may be drilled on a 20-acre pattern.

Cores in the Paluxy at —2,778-80 ft. had a show, at —2,780-92 ft., recovered 2 ft. of oil sand and 10 ft. of salt water sand; at —2,831-49 ft., 1 ft. of shale streaks, 7 ft. of oil sand with good stain and odor, 2 ft. shaly sand with stain and odor, 3 ft. of oil sand, 1 ft. of shale. At —3,364-95 ft., core recovery was 14 ft. of oil sand, 4 ft. of shale, 2½ ft. of oil sand, 2½ ft. of shale. Electric-log interpretations indicate fair pay in Paluxy at —2,773-82 ft., good pay at —2,824-41 ft., very weak at —3,112-21 ft., and best pay (22 ft. net) at —3,357-90 ft.

Offsets have been staked by Magnolia Petroleum Co. and Carter Oil Co. Operators are optimistic about possibilities of still deeper pays, since nearby Fouke produces as deep as the Smackover at around 9,500 ft.

SOUTH LOUISIANA

Tuscaloosa Produces In Big Island

NEW ORLEANS.—New oil production has been opened at Big Island pool in the Tuscaloosa by Union Producing Co. et al 1 Belgard, 14-4n-3e, in Rapides Parish. On potential test this well flowed 361 bbl. of 46° gravity oil through a 3/16-in. choke. Gas-oil ratio 1,524 to 1, tubing pressure 1,800 lb., casing pressure 1,450 lb. with 0.1 per cent water. Total depth is 12,010 ft. and production is through perforations at 9,714-22 ft. and 9,684-9,700 ft. The Tuscaloosa was topped at 9,260 ft.

Two miles south of Shuteston oil field in St. Landry Parish, Sun Oil Co. 1 Darby, discovery well of South Shuteston gas field, flowed an unestimated amount of dry gas through 7/64-in. choke and was shut in with no gage made. Tubing pressure 3,650 lb.

The California Co. 4 E. P. Brady, Unit 4, 19-16s-24e, prospective new field opener in the Alliance area 3 miles southeast of Bayou de Fleur field, Plaquemines Parish, was drilling ahead below 13,051 ft. in shale at latest report. Log was run to 12,225 ft. before drilling ahead.

Atlantic Refining Co. is preparing to make a production test in its 1-A State-Lake Pontchartrain, on State Lease 318, off shore in St. Tammany Parish, Big Point area, in Township 9s-12e. This is the third of four tests Atlantic is drilling in Lake Pontchartrain, the first two being dry holes, and a fourth which is ready to start operations. This hole was drilled to a total depth of 11,052 ft. where an electrical log was run and sidewall samples taken before plugging back for a 5½-in. pipe setting to 9,370 ft.

Two attempts have been made to confirm production on the north flank of the Napoleonville dome, Assumption Parish. Both wells were dry. Humble Oil & Refining Co. 1 Kessler-Sternfels, southwest offset to Shell Oil 1 Triche oiler, 33-12s-13e, is dry at a total depth of 9,370 ft. in a sidetracked hole. Salt was topped in the first hole at 8,942 ft. Tide Water Associated Oil Co. 1 E. O. Trahan, west offset to the Shell producer, is dry, with no commercial shows to a total depth of 9,672 ft.

A new gas pool was opened in St. Landry Parish this week, while a new oil sand was discovered in Big Island Parish. Of the 18 new locations reported this week 4 are wildcats, 1 each in Acadia, Calcasieu, Jefferson Davis and St. Bernard parishes.

SOUTH LOUISIANA SUCCESSFUL WILDCATS

Rapides Parish: New oil sand, Big Island pool—Union Producing Co. et al 1 Belgard, center NE NW 14-4n-3e, TD 12,010 ft., top sand 9,714 ft., perf. 24 holes 9,714-22 ft. and 48 holes 9,684-9,700 ft., PT 361 bbl. per day through a 3/16-in. choke, gas-oil ratio 1,524 to 1, TP 1,800 lb., CP 1,450 lb., gravity 46°, 0.1 per cent water. Top Tuscaloosa 9,260 ft., Paluxy 10,593 ft.

St. Landry Parish: New gas pool, South Shuteston field—Sun Oil Co. 1 Darby, 2 mi. S of Shuteston oil field, 6-8s-4e, TD 10,854 ft., top sand showing gas 9,965 ft., perf. 88 holes 9,965-85 ft., flowed unestimated amount of dry gas through 7/64-in. choke and shut in, TP 3,650 lb., no gage.

CALIFORNIA

Search for Vedder Production In Kern County Continues

LOS ANGELES.—The search for deep Vedder production in seven active drilling operations or projects in Kern County is drawing considerable attention to the San Joaquin Valley district. Successful completion of one or more of the deep wells would furnish the impetus to maintain this deeper exploration program.

Three of the seven projected deep drilling projects in Kern County are at 13,000 ft. or deeper, another is drilling at approximately 11,000 ft., and one is at 11,500 ft.

Deepest of the active deep wells in Kern County is Belridge Oil Co. 62-W-33, in the South Belridge field which is drilling at 13,050 ft. Operators are withholding geological information on this well but rumors were circulated 2 weeks ago that a sand showing oil had been drilled amound 12,000 ft. The rumor was unconfirmed and the fact that operators continued drilling without apparent disposition to make formation test or other detailed investigation indicates that productive possibilities, if a sand were encountered, were not considered encouraging.

An "edge" well appears to be developing in Honolulu Oil Corp. 22-266 Midway Premier, a well 987 ft. south and 918 ft. east from the center of 22-29s-21e, in the Cymric pool, Kern County. On the most recent formation test after gun perforating from 5,546-85 ft., operators recovered 1,435 ft. of fluid, including 785 ft. of salt water. The well is bottomed at 5,816 ft. Pipe has been perforated at 5,590-5,600 ft. and at 5,582-87 ft. in addition to the most recent zone tested.

Cleveland Oil Co. was credited with hitting a good oil sand at 5,221 ft. in its wildcat in the Mountain View area, Kern County. The oil sand in Cleveland 1 Ten Eyck, in 29-30s-29e, was reported just below top of the upper Transition.

A slight decline was reported again this week in new operations. Thirty-three new locations for the week compared with 37 for the previous week. New operations are widely and evenly scattered, four new lo-

(Continued on page 168)

MICHIGAN

Sohio Gets Flowing Well In Montcalm County

SAGINAW. — Development in Douglas Township, Montcalm County, got a lift as Sohio Petroleum Co. reported flow of 281 bbl. in 17 hours on test of its 2 LeBeck in Section 1, best of four producers completed in the past week. Completions totaled 12, 1 a gas well, the other 7 dry holes, 6 of them wildcats. Smaller producers in Bloomer-Montcalm and Norwich-Missaukee and a 10-bbl. producer on a Sun Oil Co. deep test in Winterfield-Clare were reported. The Clare well went to 5,073 ft., was plugged back to 5,061 ft.

Three additional locations in Allegan's new wildcat area in Caso Township were among the 19 new locations reported. They included four aiming for oil in Newaygo County's Goodwell Township. Locations in 12 counties also included two each in Roscommon and Van Buren, one each in Genesee, Gratiot, Huron, Isabell, Clinton, Wexford, Montclam, and Mecosta.

MICHIGAN WILDCAT FAILURES

Allegan County, Allegan Township: Hubert J. Smith 1 Leo Lovett, NE NE SE 23-2n-13w, dry in Traverse limestone, TD 1,500 ft.

Hopkins Township: Cook & Sleep 1 Fred Arnsman, SW SE NW 31-3n-12w, dry in Traverse limestone, TD 1,556 ft.

Watson Township: Clifford A. Perry 1 Clare E. Cady, NE NW SE 27-2n-12w, dry in Traverse limestone, TD 1,634 ft.

Clinton County, Greenbush Township: Ohio Oil Co. 1 Peter Hankey, SE SE SE 3-8n-2w, dry in Monroe, TD 3,079 ft.

Genesee County, Flushing Township: Bridgeport Oil Co., Inc. A-1 A. J. Bailey, SW SW SE 6-8n-5e, dry in Dundee, TD 2,750 ft.

Isabella County, Broomfield Township: Carter Oil Co. 5 Diana Hill, E½ SE SE 33-14n-6w, dry in Dundee, TD 3,687 ft.

Big Smoothies

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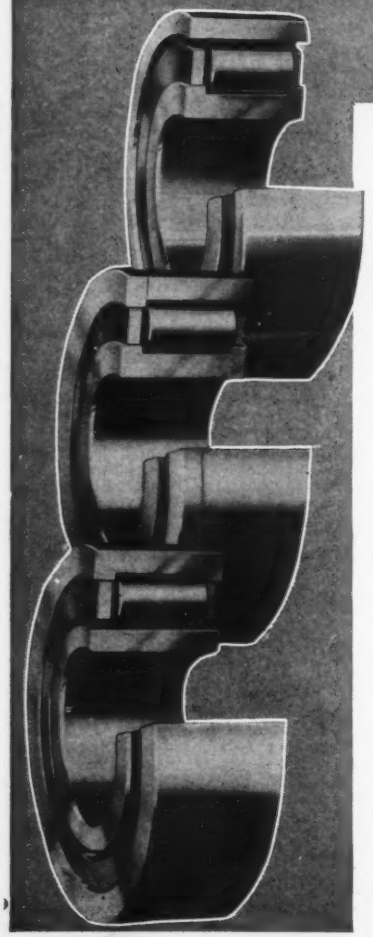

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ROCKY MOUNTAIN

Montana Discovery Being Checked Carefully

DENVER.—Texas Co. is drilling ahead at 4,188 ft. in its 2 Nick Lass, NE SW 14-33n-4e, a Devonian test in the East Utopia district, Liberty County, Montana, and it probably will be several weeks before the full significance of the discovery will be apparent. It had the top of the Devonian at 3,329 ft., and at 3,562-72 ft., in the Jefferson dolomite, had excellent porosity, with fairly live brown oil in cores at 3,576-91 ft. A drill-stem test at 3,563-91 ft. showed an estimate of 20,000,000 cu. ft. of sweet gas. A test at 3,687-3,871 ft. resulted in a recovery of 1,000 ft. of contaminated drilling mud and sulfur water. Some other shows were not measured. The top of the Madison was at 2,326 ft., and at that horizon it was estimated at 12,000,000 cu. ft. of gas. The operator has a very large block of leases on an east-west trend and for the past 2 years has been drilling several shallow wells to the Madison, most of which had oil and gas shows, to work out the sub-surface geology.

Although the Cat Creek field in Garfield and Petroleum counties, Montana, has not come up to optimistic predictions as of last September when a discovery was made in a lower pay, a sand in the Ellis formation, production has shown a very substantial gain as a result of the new development. The gross production of the field for 1945, as reported by the Oil Conservation Board, was 130,691 bbl. In the first 6 months of 1946 it jumped to 239,536 bbl., an increase of 108,845 bbl., or 84 per cent above the entire output for last year. The field was down to approximately 200 bbl. per day when the deeper pay was discovered. Several wells completed in the Ellis late last fall boosted the average for the year to 358 bbl. per day. Production in June of this year was 49,045 bbl., an average of 1,301 bbl. per day. There were 119 producing or producible wells in the field on January 1, 1946, including several of the Ellis sand wells. These had increased to 139 wells as of July 1, this year.

Church Buttes deep test.—Mountain Fuel Supply Co. 3 Unit, NE SW NE 12-16n-113w, Church Buttes structure, Uinta County, Wyoming, is rigging up what is described as the largest power rotary unit ever brought into the Rocky Mountain area for its third deep well. This has led to a report, unconfirmed, that the third well, which is located 1½ miles west of the discovery, will go to the Tensleep (Weber in the Rangely field) at around 15,000 ft.

High pressure equipment is reported being installed at the discovery well before further testing will be attempted. In the final test reported, open 3 hours and 30 minutes, it flowed gas at the rate of 28,633,000 cu. ft. per day through a 5/8-in. choke. Before the test casing pressure was 5,375 psi., and 2,425 psi. during the test. The second well, 5 miles northeast of the discovery, is drilling below 3,191 ft.

Outpost at Wilson Creek.—Texas Co.-California Co. 31 Unit, SW SW NE 2-2n-94w, an outpost of southeast side of Wilson Creek, Rio Blanco County, Colorado, and final well in present development program, was completed at 6,715 ft., and flowed at the rate of 181 bbl. per day through 3/16-in. choke and 351 bbl. through 5/8-in. choke. It was completed through

perforations opposite the Morrison and Sundance sands.

New operations.—Fourteen new operations were reported, all development wells, of which 3 were in the Rangely field, and 1 at Iles, in Colorado; 1 each in Crook's Gap, Salt Creek, Big Muddy and South Spring Creek, in Wyoming; and 2 in Bowdoin, 2 in Kevin-Sunburst, and 1 each in Cut Bank and Cat Creek, in Montana.

WYOMING WILDCAT FAILURE

East Cherokee Ridge, Sweetwater County: Cities Service Oil Co. 1 Geier, SW NE NW 1-12n-95w, TD 5,501 ft., top Hiawatha sand 2,193 ft., Fort Union 5,072 ft., dry.

MONTANA WILDCAT FAILURE

Cut Bank, Glacier County: A. B. Cobb & Co. 5 D.C.-9, SE NE NW 24-32n-6w, TD 3,240 ft., top of Madison 3,231 ft., sulfur water, plugged.

UTAH WILDCAT FAILURE

Farnham, Carbon County: Mountain Fuel Supply Co. 1 Farnham, SW NE SE 12-15s-11e, TD 5,722 ft., dry, plugged back to Morrison at 3,155 ft. and completed for 3,250,000 cu. ft. carbon dioxide gas.

EASTERN TEXAS

Woodbine Pool Opened In Cherokee County

DALLAS.—Delta Drilling Co. and W. W. Wise 1 J. Huggins, Levi Jordan Survey, has opened a Woodbine pool 9 miles southwest of Rusk in Cherokee County. The well kicked off on the fourth swab pull. After cleaning up, it flowed at the rate of 15 bbl. of 44° gravity oil an hour through ¼-in. choke. Completion was from open hole at 5,120 ft. Casing pressure was 475 lb. and tubing pressure 650 lb. There was no water.

Humble Oil & Refining Co. 1 Dowell, Sanders Survey, east offset to the discovery well in the Mount Sylvan field of Smith County, is dry in the upper Glenrose at 7,714 ft. The well ran low and found water in the Paluxy. Humble will drill a north offset to the discovery. Humble 1 Hale, Ables Survey, wildcat 1½ miles north of Kemp, Kaufman County, topped the Georgetown at 3,648 ft. and the Paluxy at 4,490 ft. A core from 4,408-518 it. recovered 7 ft. of gray sandy shale. Operator was preparing to run a drill-stem test.

Delta Drilling Co. 1 Houston, Martin Survey, wildcat at Martin's Mill, Van Zandt County, is drilling below 7,100 ft. in lime and shale, after cleaning up a fishing job at 6,973 ft. Paluxy was topped at 6,660 ft. B. F. Phillips 2 Crews, Perkins Survey, 6 miles south of Gladewater, Gregg County, is dry at 3,752 ft. in the Woodbine topped at 3,705 ft. Location is north of the 1 Crews, which gave Woodbine pay indications.

Carthage field, Panola County, had five completions this week, and Hawkins field, Wood County, and Talco field, Franklin and Titus counties, each had two. Hawkins and Carthage fields each had three locations and Quitman field, Wood County, had two. Carthage field has 27 drilling wells; Hawkins field, 18; Opelika field, Henderson County, Sand Flat field, Smith County, and Quitman field each have 5; Waskom field, Harrison County, and New Hope field, Franklin County, each have 4 and Manziel field, Wood County, has three.

EASTERN TEXAS WILDCAT FAILURES

Falls County: O. A. Guest 1 D. G. Wooten, James Powell Sur., 8 mi. S Marlin, elev. 384 ft., Edwards 2,136 ft., dry, TD 2,152 ft.

Lamar County: Fred Jones 1 J. C. Gambill, A. W. Wright Sur., 5 mi. NW Paris, elev. 549 ft., Paleozoic 3,005 ft., dry, TD 3,021 ft.

N. CENTRAL TEXAS

Oil Trace Found In Grayson Wildcat

WICHITA FALLS.—Standard Oil Co. of Texas 1 A. G. Mitchell, J. B. McNair Survey, Grayson County wildcat 1½ miles northwest of Sherman, encountered a trace of oil and gas in sandy lime from 10,868-874 ft. Operator cored from 10,876-86 ft. and recovered 3 ft. of hard gray sand and laminated white lime and 3 ft. of white lime banded with gray shale. It was drilling below 10,955 ft. in brown lime and dark shale.

Tom B. Medders 1 W. B. Fuller, Section 5, Block 1, H&TC Survey, scheduled 5,700-ft. Archer County wildcat 8 miles south of Wichita Falls, topped the Caddo at 5,248 ft. It is drilling below 5,528 ft. in Barnett shale. Ed C. Lawson and Ben H. Rankin will drill a 3,300-ft. wildcat in Wilbarger County 1 mile northwest of the Castleberry pool and 1½ miles southeast of the National Victory pool. It is 1 W. J. Baker, 330 ft. from the south and west lines of northeast quarter of Section 85, Block 14, H&TC Survey, 4 miles south of Vernon.

Fred M. Manning, Inc. 1 O. H. Parrot, Section 962, TE&L Survey, wildcat 3 miles northwest of Woodson, has opened a new Caddo producing area in Throckmorton County. It was perforated with 20 shots from 3,918-23 ft. and flowed an estimated 50 bbl. of oil hourly after 2 hours of swabbing and having been shut in 12 hours. It is waiting on official test.

Electra field, Wichita County, has four completions this week, Ross field, Clay County, three, and National field, Wilbarger County; Lawson-Rose field, Haskell County; Almon field, Cooke County, and Thomas field, Archer County, each had

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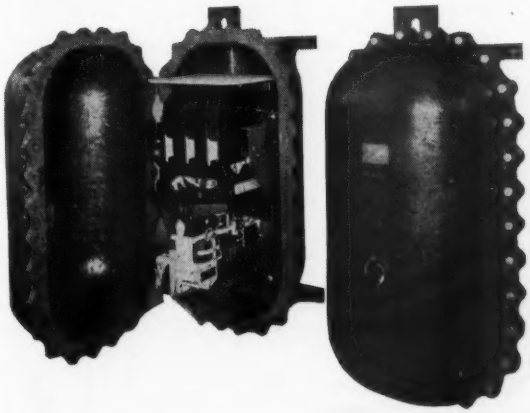

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two completions. Wilson field, Cooke County, had four locations; Holliday and Albers fields, Archer County, three, and Electra and KMA fields, Wichita County, two each. National field has seven drilling wells; Wilson and Sivell's Bend fields, Cooke County, five; Rose field, Haskell County, four; Cope and Johnson fields, Young County, three each, and Hull and Silk and Cooper fields, Archer County, two.

In West Central Texas, Reddin field, Taylor County, and Palo Pinto County Regular field, each had two completions; Coleman County Regular field and Nail field, Stephens County, each had one. Reddin field had two locations, and Coker field, Coleman County, and Cisco field, Eastland County, each had one. Eolian field, Stephens County, has five drilling wells; Eastland County Regular field, four; Lewis Steffins field, Jones County, three, and Silver Valley field, Coleman County, two.

NORTH CENTRAL TEXAS SUCCESSFUL WILDCAT

Jack County: New oil pool—Hanlon-Buchanan 1-B J. Moore, BBB&C Sur. A-1376, 3½ mi. S and 6 mi. E Antelope, elev. 941 ft., pumped 11 bbl. day, perf. 5,985-6,003 ft. Ellenburger, gravity 38°, TD 6,003 ft.

NORTH CENTRAL TEXAS WILDCAT FAILURES

Archer County: W. B. Hamilton 1 Roy Graham, F. Gibemath Sur., 1 mi. S Anarene, dry, TD 1,200 ft.

Harvey Drlg. 1 C. L. Abercrombie, W. S. Blount Sur. A-13, 8 mi. W Anarene, elev. 1,124 ft., dry, TD 1,372 ft.

L. Raymond Dawson, Jr., 1 A. L. Harris, Blk. 93, Harris Subd. Club Ranch, 5 mi. W and 2 mi. S Archer City, elev. 1,083 ft., dry, TD 1,395 ft.

K. E. March 1 J. Darilek, Sec. 2410, TE&L Sur., 1½ mi. S. Megargel, elev. 1,308 ft., dry, TD 1,434 ft.

Jack L. Story 1 A. Coburn, Lot 6, B. Nunley Sur., 6 mi. N Markley, elev. 1,002 ft., dry, TD 738 ft.

Timberlake & Kelleher 1 Abercrombie & Taylor, Sec. 2, SPRR Sur. A-1281, 8½ mi. W and 3½ mi. S Archer City, dry, TD 1,410 ft.

Baylor County: Paul Scott 1 G. F. Boone et al, David Allen Sur. A-6, 3 mi. N and 6 mi. E Rendham, elev. 1,122 ft., dry, TD 3,020 ft.

Jack County: Hanlon-Buchan 2 W. R. Mathis et al, G. W. Davis Sur. A-187, 1½ mi. E and 1 mi. S Hess, elev. 1,131 ft., Mississippian 5,354 ft., Ellenburger 5,410 ft., dry, TD 5,510 ft.

WEST CENTRAL TEXAS SUCCESSFUL WILDCAT

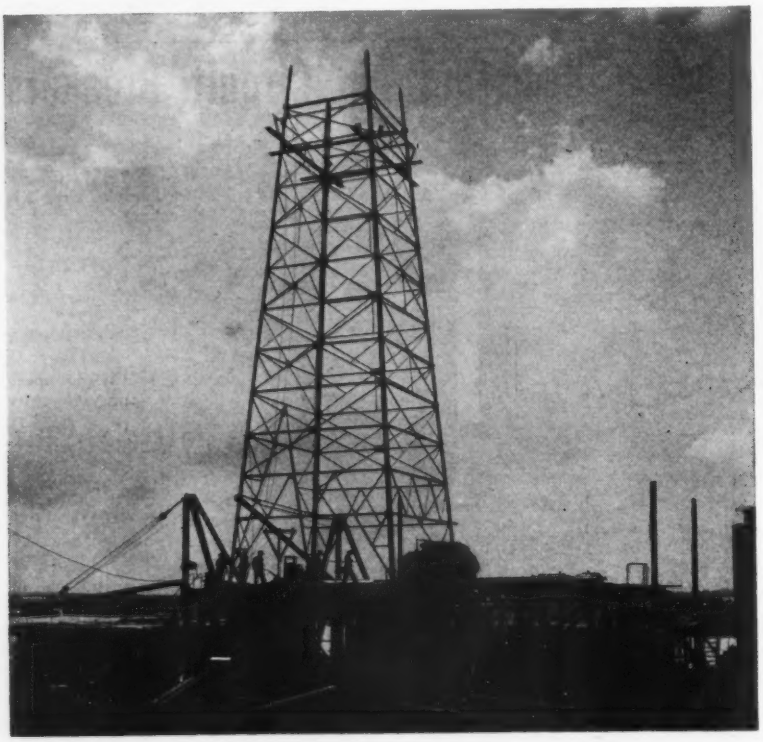
Taylor County: New oil pay—West Central Drlg. 2 Murphree, Blk. 9, SPRR Sur. No. 1, Murphree pool, elev. 1,878 ft., flowed 306 bbl. day through ¼-in. choke, perf. 2,706-10 ft. Hope, gravity 41°, TD 2,875 ft.

WEST CENTRAL TEXAS WILDCAT FAILURES

Comanche County: John W. Naylor 1 O. T. Jarvis et al, A. Sullivan Sur. No. 8, 1½ mi. NW Zourette, dry, TD 1,748 ft.

Jones County: Carl Hovgard 1 H. Propst, Sec. 10, Blk. 1, T&NO Sur., 2¼ mi. W Anson, elev. 1,761 ft., dry in Upper Hope, TD 2,833 ft.

Shackelford County: J. L. Hart 1 P. S. Fincher, Sec. 7, Blk. 11, T&P Sur., ¾ mi. N Albany, elev. 1,428 ft., dry, TD 999 ft.



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APPALACHIAN FIELD

Big Gas Well In Old Area

PITTSBURGH.—In Fayette Township, Allegheny County, Herron et al completed a test on Walter Purdy farm in the Hundred Foot sand which gaged 1,700,000 cu. ft. gas from the Hundred Foot sand, total depth 1,862 ft. This is the largest well in that area for years.

On Chestnut Ridge in Georges Township, Fayette County, Manufacturers Light & Heat Co., with surface elevation 2,437 ft., topped the Onondaga lime at 7,359 ft., and the chert at 7,401 ft. in No. 7 Barton. This places the top of the chert at —4,964 ft.

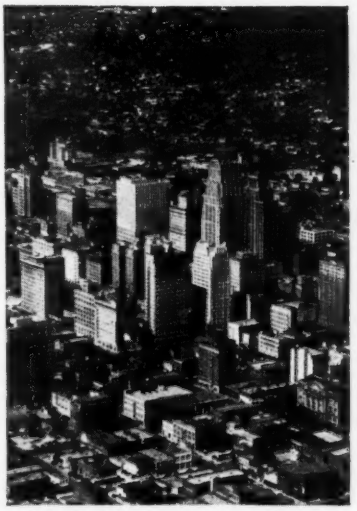
New locations totaled six, Armstrong County with three, Fayette County, Jefferson County, and Washington County, one each. In Butler district, Wayne County, West Virginia, Chartiers Oil Co. completed a large gas well in the Corniferous lime at No. 2 L. H. Hatten which had a final open flow of 5,097,000 cu. ft. from total depth 4,031 ft.

In Ripley district, Jackson County, two additional Oriskany wells were completed. Columbian Carbon Co.'s 901 E. Harlan Staats was good for 2,441,000 cu. ft. gas. Hope Natural Gas Co. completed 9,038 Margaret Harrison, gage 1,276,000 cu. ft. gas

In Southwest district, Doddridge County, P. & M. Oil Co. completed a large gas well for the area at a test on Evelyn Williams farm which gaged 1,425,000 cu. ft. from the Injun sand, total depth 1,704 ft.

In Center district, Wyoming County, United Producing Co. completed 1,345 W. M. Ritter Lumber Co. good for 1,057,000 cu. ft. gas. In Baileysville district, Hope Natural Gas completed 8,996 New River & Pocahontas Consolidated Coal Co. with a gage of 2,002,000 cu. ft. gas.

New locations totaled six and in Dekalb district, Gilmer County; Ravenswood district, Jackson County; Grant and Union



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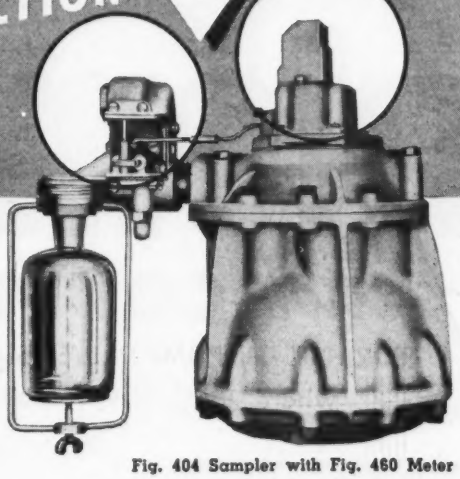

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CANADIAN FIELDS

Eastern Alberta Has Promise of a New Field

CHATHAM. — Opening possibilities of a new field in eastern Alberta, Imperial-Provost 1, LSD 3, 27-37-3w4, finished at 2,549 ft. is on steady production with initial output officially reported 31 bbl. daily with 134,000 cu. ft. gas. Production is a light crude, close to 30° gravity. Two other tests are nearing completion, Imperial-Provost 2, LSD 1, 33-37-3w4, about a mile northwest of the discovery, and Imperial-Provost 3, LSD 6, 27-20-3w5, immediately north.

Lloydminster.—In the Alberta section of the Lloydminster field, Ponalta 3, LSD 8, 12-49-1w4, finished at 1,898 ft., has initial pumping production around 60 bbl. Patricia 1, LSD 16, 1-49-1w4, is testing at 1,884 ft. On the Saskatchewan side, Van Lloyd Oils 2, LSD 10, 2-49-28w3, TD 1,880 ft. with oil sand at 1,876 ft. is a good pumper. Val Lloyd Erndell 1, LSD 15, 2-49-28w3, is standing at 1,882 ft. with oil sand at 1,880 ft.

Elk Point.—In the North-Central Alberta area, Elk Point 1, LSD 7, 26-56-5w4, finished at 3,929 ft. after drilling through 750 ft. of salt, has plugged back to 2,725 ft. to test horizons above the salt formation. A gas sand around 1,300 ft. yielded approximately 2,000,000 ft. Elk Point 1-A, same LSD, has spudded as an offset test of certain horizons encountered in the original well.

Empress.—In the Empress area, in eastern Alberta near the Saskatchewan boundary, Empress Utilities 1, LSD 7, 13-23-1w4, an exploratory test for gas, has halted drilling to test a promising horizon at 1,700 ft.

Fox Valley.—In the Fox Valley area, west-central Saskatchewan, Cypress Development 1, LSD 16, 26-17-26w3, finished drilling at 3,241 ft. Gas was encountered in six horizons between 1,513 and 3,019 ft. with oil in the latter zone and at 3,193 ft. Gas horizons at 1,550-1,675 ft. are being perforated and tested.

TEXAS GULF COAST

New Deep Pay For Sour Lake

HOUSTON.—Deep production was opened for the first time in South Lake field, Hardin County, when The Texas Co. 326 fee flowed 243 bbl. of pipe-line oil through a 12/64-in. choke under tubing pressure of 540 lb. This well is located on the original fee acreage where 43 years ago The Texas Co. 3 fee, sometimes referred to as "the granddaddy of all Texas Co. wells," was brought in as a 5,000-bbl. producer at 1,008 ft. Production is from the Yegua sand perforated with 60 shots from 5,200-10 ft. It is the first well to hit production on that lease in Yegua sand, and it is about 1½ miles from the old discovery. Operators drilled to a total depth of 6,779 ft., and after encountering salt at 6,765 ft., plugged back and set 7-in. casing at 5,444 ft., which was perforated at 5,200-10 ft. for completion. The new well is on the southwest flank of the dome and the southwest corner of the historic Texaco tract. The last producer brought in on the tract was the 323 fee, about a year ago, which produced at approximately 3,000 ft.

Also in Hardin County, L. M. Josey et al 3 Caswell Trust Co., on the east flank of the old Saratoga dome, is being completed as a good producer flowing through 280 perforations from 5,696-5,766 ft. Test is being made in a total of 90 ft. of saturation. Total depth is 5,970 ft., flowing pressure on the tubing is 850 lb. and casing pressure is 1,000 lb. No estimate was reported on the flow.

Humble Oil & Refining Co. has opened new deep sand at Lovell Lake pool in Jefferson County. This is from the 40 Jefferson Land Co. in the C. Hillebrandt Survey, which gaged 8,290,000 cu. ft. of gas per day through a 7/32-in. choke along with 137 bbl. of condensate, 47° gravity, with a flowing pressure on the tubing of 6,350 lb. and a shut-in pressure of 6,650 lb. The gas-condensate ratio is 60,500 to 1. Production is through 60 perforations at 9,030-40 ft. Total depth is 9,855 ft., and 7-in. casing is cemented to 9,128 ft.

Magnolia Petroleum Co. 1 Live Oak Farms, in J. E. W. Wallace Survey, 5 miles east of Midfields discovery well, and northeast of Blessing, has been given a potential gage. It flowed 160 bbl. of 41° gravity oil through a ⅛-in. choke, no water, with 1,300 lb. flowing pressure on the tubing, casing on seal. Gas-ratio was 744 to 1. Production is through perforations at 8,450-56 ft.

Humble has abandoned its second deep try on the north and northwest flanks of the Sugarland dome, Fort Bend County. The dry hole is 2-C Sugarland Industries in the E. Alcorn Survey, 4,800 ft. southwest of the 1 junked hole. This second well was drilled to a total depth of 9,199 ft. with no shows reported.

Pan American Production Co. 1 Callihan Unit, wildcat test in the Liverpool area of Brazoria County, Angier-Hall-Bradley Survey, west of production at Chocolate Bayou, flowed salt water on initial test through 113 perforations at 11,568-592 ft. These perforations were squeezed and operators are preparing to make another test.

George W. Strake et al 1 A. E. Humphries et al, is wildcat failure 1 mile west of Fitzer in Waller County, in John H.

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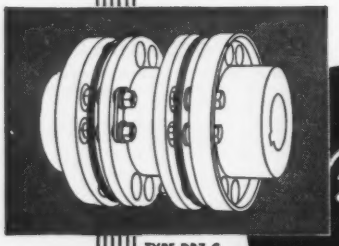

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Pierson Survey. Drilled to a total depth of 11,816 ft., with no shows reported below the 7-in. casing. On a test through perforations at 10,451-461 ft., well flowed a small amount of gas and some amber-colored distillate, but pressure dropped in 2 hours from 800 lb. to 200 lb. Other tests failed to show anything, or recovered salt water.

There were 15 new locations reported this week, with Fort Bend County receiving two wildcats and Matagorda County one. The remaining 12 locations were in proven areas. Three new sands were opened to production in this area, two gas-condensate wells, one each in Brazoria County, Blue Lake field, and Jefferson County in Lovell Lake field. The new oil pay was in Sour Lake field of Hardin County. Three dry wildcats were reported, one each in Jefferson, Waller, and Wharton counties. Brazoria County received the greatest activity, receiving four completions.

GULF COAST SUCCESSFUL WILDCATS

Brazoria County: New gas-condensate sand Blue Lake field—McCarthy Oil & Gas Corp. 1 Holland et al, John Bradley League, TD 11,379 ft., sand 10,980-11,055 ft., perf. 140 holes 10,980-11,014 ft., PT 55 bbl. condensate per day through a ¼-in. choke, and open flow 135,000,000 cu. ft. gas per day, gas-condensate ratio 185,000 to 1, TP 6,500 lb., 55° gravity, no water.

Hardin County: New oil pay Sour Lake field—Texas Co. 326 Texas Co. fee, Stephen Jackson League, TD 6,779 ft., top sand 5,197 ft., perf. 60 holes 5,200-10 ft., in Yegua sand, PT 243 bbl. per day through 12/64-in. choke, gas-oil ratio 420 to 1, TP 540 lb., 24° gravity, no water.

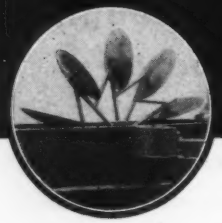
Jefferson County: New gas-condensate pay Lovell Lake field—Humble 40 Jefferson Land Co., C. Hillebrandt Sur., TD 9,855 ft., top sand 9,030 ft., perf. 60 holes 9,030-40 ft., PT 8,290,000 cu. ft. gas per day through 7/32-in. choke and 137 bbl. condensate per day, gas-condensate ratio 60,500 to 1, TP 6,350 lb., shut-in TP 6,650 lb., gravity 47°, no water.

UPPER GULF COAST WILDCAT FAILURES

Jefferson County: L. D. Cartwright 1 Francis Hazlip, Nederland Townsite, Otto Roff Survey, TD 5,346 ft., dry.

Waller County: Geo. W. Strake et al 1 A. E. Humphries et al, John H. Pierson Sur., 1 mi. W of Fitzer, dry, TD 11,816 ft.

Wharton County: John B. Coffee 1 Mrs. L. Lehnerd, Noland Keller Survey, 2½ mi. E of E. Mauritz field, dry, TD 6,523 ft.



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PERMIAN BASIN

Fisher County Discovery Flows 480 Bbl.

MIDLAND.—Skelly Oil Co. 1 D. O. Huddleston, Section 11, Block 19, T&P Survey, Fisher County discovery 8 miles north of Trent in the southeast corner of the county, has been completed to flow 480 bbl. of oil in 23 hours through open 2-in. tubing. Gravity of the oil is 40.9°. Gas-oil ratio is 1,000 to 1. Casing pressure was 620 lb. and tubing pressure 50 lb. Production is in the Palo Pinto topped at 4,309 ft. The Canyon lime which showed oil on a drill-stem test has been cased off.

Bennett & Sorrels et al 1 F. S. Sanders, Section 186, Washington County School Land Survey, Tom Green County wildcat 11 miles northwest of San Angelo, ran a 33-minute drill-stem test from 6,633-47 ft. in the Ellenburger. Recovery was 60 ft. of drilling mud with no shows. It was drilling below 6,705 ft. in lime. Humble Oil & Refining Co. 1 Mary E. Turner, Block 37, T-2-S, W. T. Holcome Survey, Midland County wildcat 2 miles south of 1 Buchanan, discovery well of the Midland field, ran a 20-minute drill-stem test from 4,321-4,715 ft. It recovered 920 ft. of mud and 2,440 ft. of salty sulfur water. There were no shows of oil or gas. It was drilling below 4,755 ft. in the San Andres.

Fullerton Oil Co. 342-A H. M. Wilson, Section 16, Block A-32, Public School Land Survey, ¼ mile due east of the discovery well for Ellenburger production on the west side of the Fullerton field, has been completed. It flowed 932 bbl. of 39.9° gravity oil in 24 hours through a 24/64-in. tubing choke. Gas-oil ratio was 250 to 1. Pay came from the section between 9,783 ft. to the plugged-back total depth of 9,906 ft. The well was drilled to 10,026 ft. and developed sulfur water in the bottom of the Ellenburger. Shell Oil Co., Inc. 1 Pinson, Section 12, Block A-40, Public School Land Survey, ¾ mile southwest of Shell 1 A. Nelson, Ellenburger discovery in western Andrews County, was drilling below 10,662 ft. in the Joins section, the zone above the Ellenburger.

Stanolind Oil & Gas Co. et al 35-A Hendrick, Section 33, Block 26, Public School Land Survey, 3½ miles west of Kermit, Winkler County, continued fishing drill-pipe with hole bottomed at 13,416 ft. Stanolind 1 Kayser, Section 34, Block 43, T-2-S, T&P Survey, deep test 1¼ miles west of the South Cowden field, Ector County, was drilling below 13,116 ft. in lime and shale. Argo Oil Corp. 1 Roberts, Section 294, Block 13, H&GN Survey, 13 miles northeast of Balmorhea, Reeves County, was drilling below 12,952 ft. in the Wolfcamp.

Fullerton field, Andrews County; Welch field, Dawson County; TXL field, Ector County; Keystone-Ellenburger field, Winkler County, and Slaughter field, Cochran County, each had three completions this week. Fullerton field had five locations;

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North Cowden field, Ector County; North Ward Estes field, Ward and Winkler counties, and Toborg and Taylor-Link fields, Pecos County, each had two. TXL field has 35 drilling wells; Fullerton field, 29; Keystone-Ellenburger field, 23; Welch field, 13; Todd Deep field, Crockett County; Block 31 field, Crane County, and Keystone-Colby field, Winkler County, each six, and Keystone-Holt field, Winkler County, and North Goldsmith field, Ector County, each has five.

WEST TEXAS WILDCAT FAILURES

Howard County: Duncan Drlg. 1 B. M. Newton, Sec. 9, Blk. 33, T-1-N, T&P Sur., 6½ mi. NW Big Spring, elev. 2,611 ft., Grayburg 2,890 ft., dry, TD 3,226 ft.

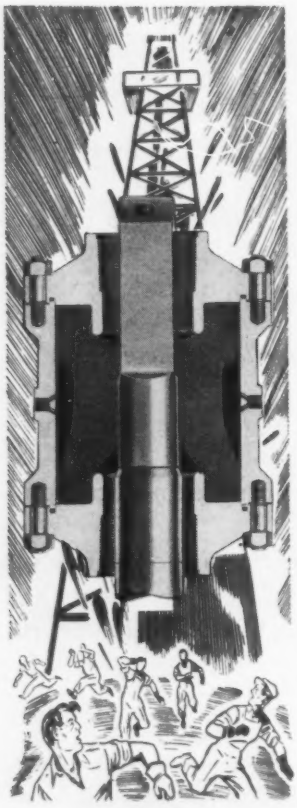
Upton County: W. G. Gruber and H. A. Ringle 1 Mayhew-Superior, Sec. 2, Blk. W, GC&SF Sur., 3 mi. SE Hurdle, elev. 2,411 ft., dry, TD 1,852 ft.

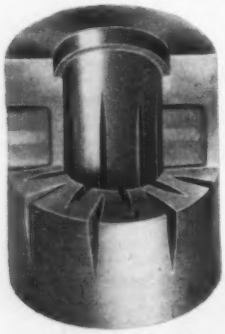
SOUTHEASTERN NEW MEXICO

HOBBS.—Great Western Producers, Inc. 1-B Maxwell - State, 12-13s-31e, has been completed as an extension well to the south side of the Caprock field in southeastern Chaves County. The well made a 24-hour flowing potential of 432 bbl. of oil from red sand pay from 3,022-56 ft., natural, through open tubing. Magnolia Petroleum Co. 1 Black Hills unit, 31-37s-20e, southwestern Chaves County wild about 25 miles west of Artesia, was making hole below 1,605 ft. in anhydrite. Drilling has been slowed up on account of cavities which have caused loss of circulation. This wildcat is scheduled to go to around 8,000 ft.

The Texas Co. 13-O State, 12-17s-32e, a south outpost to the West Roberts field in west central Lea County, has been completed. The well swabbed and flowed at the rate of 125 bbl. of oil daily from pay section between 4,177-250 ft. in lime. Tide Water Associated Oil Co. 2 Clifton, 4-22s-37e, northwest outpost to production from the Ellenburger in the Brunson field, east central Lea County, topped the Ellenburger at 8,010 ft. on an elevation of 3,443 ft. The test was drilled to 8,096 ft. and cemented 5½-in. casing at that point. Operator was preparing to drill out cement and perforate the casing to test. The formation had shown that it would produce oil and gas before the casing was run, and operator expects to complete a well of some size.

Square Lakes field, Eddy County, and Drinkard and Paddock fields, Lea County, each had one completion. Grayburg-Jackson and Red Lakes fields, Eddy County, and Caprock and Drinkard fields, Lea County, each had one location. Drinkard field has 16 drilling wells; Grayburg-Jackson field, 12; Square Lakes and Paddock fields, each 8; Langlie-Mattix, Brunson and Maljamar fields, Lea County, 4 each.





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SOUTHWEST TEXAS

New Deep Pay at N. Minnie Bock Pool

CORPUS CHRISTI.—A new deeper oil pay zone at North Minnie Bock field in Nueces County has been completed by Atlantic Refining Co. The 1 George Renken gaged 185 bbl. of oil per day while testing on ⅛-in. and 9/64-in. chokes, with 660 lb. tubing pressure, casing sealed. Production is through perforations at 7,877-81 ft., which is considerably deeper than the discovery oil pay at 6,230 ft. level, but above the discovery gas-condensate sand at 8,254 ft. Total depth is 9,431 ft. and 5½-in. casing was set at 9,115 ft. This well tested 38° gravity oil through perforations at 6,025-35 ft. above the discovery oil pay, but failed to develop flowing production at that level.

Sun Oil Co. 6 D. J. Sullivan new deep gas - condensate discovery in northeast Brooks County, 4½ miles southeast of Falfurrias and northeast of the Typ Hill dome, is preparing to perforate additional holes in the casing between 10,439-79 ft. for final completion. This well has flowed gas on previous tests through perforations at 10,478-79 ft., and 10,439-41 ft., but these perforations were squeezed to get a good cement job behind the casing. Production test was run on the squeezed perforations, open 23 hours using ¼-in. choke on the tubing, and flowed 57 bbl. of condensate with 1,015 lb. tubing pressure. Total depth is 13,206 ft., with 5½-in. casing cemented to 12,180 ft.

J. O. Clark, Jr. 2-A Gonzales Unit, outpost test on extreme southwest end of the Kelsey field, in Starr County, recovered three stands of 42° gravity oil in 20 minutes on drill-stem test at 5,709-13 ft. through 3/16-in. bottom and 1-in. top choke. On test at 5,713-25 ft. recovered 6½ stands of oil in 20 minutes through the same chokes. The well was drilled to a total depth of 5,739 ft. and the 5½-in. casing was set on bottom for the completion.

H. R. Smith and W. C. McBride, Inc. 1 E. G. Whitten, gas-condensate discovery in Nueces County, about 2 miles northwest of Bishop and 3 miles east of Stratton field, was shut in after flowing an estimated 30,000,000 cu. ft. of gas per day on open flow, through perforations at 7,038-46 ft. Shut-in pressure is 2,800 lb. On drill-stem test made through these perforations 150 ft. of condensate were recovered in 6 hours, with 2,500 lb. working pressure. This is a deepening job in an abandoned hole originally drilled by Southern Minerals Corp. in 1942 to depth of 7,506 ft. The new operators deepened to 7,878 ft. and set 5½-in. casing to 7,350 ft. for completion as a gas-condensate well.

The second well for the newly discovered Fashing field in Atascosa County,

(Continued on page 168)

ILLINOIS

Cumberland County Wildcat May Open New Oil Field

MATTOON. — National Associated Petroleum Co. 1 B. J. Krogmann, NW NE SE 31-9n-7e, rank wildcat in Cumberland County, is showing promise of opening the second oil pool to be discovered in that county in several years. A 1-hour drillstem test recovered 900 ft. of gas, 578 ft. of oil and 30 ft. of oil-cut mud. No information as to formation tops and depth of the actual producing zone has been released, but total depth of the hole is 2,454 ft. and cement plug is now being drilled to test the McClosky lime. This well is about 15 miles south and slightly west of production in the Mattoon field and nearly 18 miles due west of production in the one-well Hidalgo North field of Cumberland County.

The Mt. Carmel pool of Wabash County has been extended one location to the west by the Magnolia Petroleum 8 Campbell Heirs, SE SW NE 7-1s-12w. Operators are now making a production test of the Levias lime after perforating with 48 shots at 2,315-28 ft. and acidizing with 1,000 gal. The well made 183 bbl. of oil on swab during the first 12 hours of testing.

A. J. Slagter 1 Branch, SW NW SE 4-2n-2e, Marion County wildcat, is continuing to test the McClosky at 2,125-72 ft. On the latest gage, the well made 24 bbl. of oil and 80 bbl. of salt water. In Wabash County the Geo. S. Engle 1 Clint Guisewite, SW SW SE 23-1n-13w, either a pool opener or an extension of the Friendsville field, is testing following an 80-qt. shot in the McClosky at 2,606-31 ft., total depth, with no gage reported. Previously, the well made 100 bbl. of oil in 24 hours following an acid treatment of 3,000 gal. in the Rosiclare at 2,599-2,606 ft.

Illinois completions during the past week remained at about the same level with the previous week with a total of 42 wells reported. These included 24 oil wells and 17 dry holes, of which 2 were successful

(Continued on page 168)

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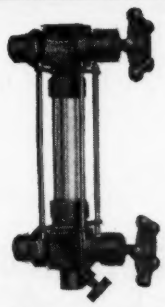

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OHIO, KENTUCKY

East Crooksville Gas Pool Extended in South

COLUMBUS.—Ohio Fuel Gas Co. 3 M. E. Hull, Section 34, York Township, Morgan County, extends the East Crooksville gas pool a location to the south. Clinton, topped at 3,697 ft., gaged 798,000 cu. ft. at 28 ft. in. The sand will be drilled to the bottom and shot.

After an inactive period, Waverly Oil Works Co. has completed a well in the New Straitsville pool. Its 11 Tracy & Hitchcock, Section 33, Coal Township, Perry County, logged the Clinton at 3,342-77 ft. and after a shot, the well made 250,000 cu. ft. and 25 bbl.

Lupher Drilling Co. 5 E. A. Bryan, Section 19, Pike Township, Coshocton County, adds another producer to the Five Mile Run pool. Clinton at 3,200-53 ft. made 50 bbl. in 24 hours. Two additional wells are drilling in the pool.

The Flint Ridge gas pool in Hopewell Township, Muskingum County, was extended a location south by E. H. Everett Co. 1 H. W. Shuey, Section 7. Clinton was found at 3,155-81 ft. with a natural gage of 1,250,000 cu. ft.

The new location rate remains high with 31 for the week. Cambridge accounted for eight, Lancaster seven, Stewart and Sandyville five each, Ashland four. A record high of 231 strings of tools are now running in the state.

WILDCAT FAILURE COMPLETED

Lorain County, La Grange Township: Ohio Fuel 1 Mary Silec, Lot 42, Clinton, no sand, TD 2,375 ft.

EASTERN KENTUCKY

ASHLAND. — Only one completion was noted in the eastern Kentucky field of operations last week, with little activity reported.

Kentucky-West Virginia Gas Co. completed No. 5657 on the Charles Short property in Knott County, total depth 3,153 ft., daily open flow 71,000 cu. ft. in shale.

WESTERN KENTUCKY

OWENSBORO.—Operators in the western Kentucky area met with little success in their search for oil during the past week as five of the six wells completed were dry holes. Three of the dry holes were wildcats. Five new operations were announced during the week, and these were located two in Daviess County and one each in Henderson, Webster, and Muhlenberg counties. Included in the new operations were two new exploratory tests, the Carter Oil Co. 1 J. L. Conley, SW SW NW 10-O-22, north of the Dixie pool in Henderson County, now drilling surface hole, and the R. E. Moran et al 1 Pemberton, NE SE NW 6-O-29, Daviess County, where operators are moving in rotary tools.

WESTERN KENTUCKY WILDCAT FAILURES

Hopkins County: H. H. Weinert 1 Haywood, SE¼ 24-L-25, elev. 423 ft., dry at 3,089 ft., Glen Dean 2,452 ft., Barlow 2,695 ft., Ste. Genevieve 2,940 ft., Fredonia 2,990 ft.

Muhlenberg County: Texas Co. 1 Rogers Coal Co., dry at 2,171 ft., Ste. Genevieve 1,911 ft., St. Louis 2,163 ft.

Ohio County: Kingwood Oil 1 Galey Min-

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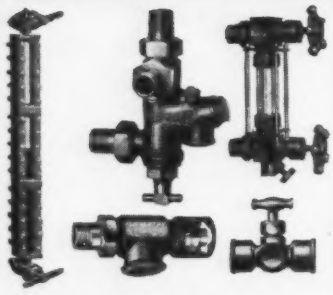

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eral, SE SE NW 3-N-34, dry through St. Louis, TD 954 ft.

INDIANA

EVANSVILLE.—Continental Oil Co.'s deep test in the Griffin pool of Gibson County, the 1-D Cooper Estate, SW SW 13-3s-14w, may be classed as a failure in so far as proving production from any deeper formation. The well was drilled to a total depth of 6,408 ft., and topped the Devonian at 4,631 ft. and the Trenton at 6,177 ft. without finding any commercial shows of oil in either of the formations. Operators have now plugged back to test shows encountered in the St. Louis lime at 3,142-48 ft.

Indiana completions totaled eight during the past week, including five oil wells and three dry holes. Seven new operations were announced, none of which were wildcats. These were located four in Gibson County, two in Posey and one in Spencer.

LA.-ARK.

Spirit Lake Discovery Has Offset Locations

SHREVEPORT.—Arkansas' new Spirit Lake field in Lafayette County is attracting a number of operators and last week Carter Oil Co. staked a south offset to the discovery, at its 1 Hyrum Moore Estate in SW SE 14-16s-25w. Drilling was to get under way as soon as possible.

Magnolia Petroleum Co. staked an east offset to the discovery at its 1 Hyrum Moore Estate in NW NE SE 14-16s-25w, and also announced plans for a test on the north offset location.

Meanwhile the discovery, Austin Stewart, H. G. Lewis, Jr., and Crow Drilling Co.'s 1 Moore was producing some 250 bbl. of oil a day with a gas-oil ratio of 316:1. Bottom-hole pressure is 1,785 lb. and gravity of the oil is 40 degrees. Production is from two sets of perforations in the lime at 4,142-52 ft. and 4,108-18 ft.

The Arkansas Oil and Gas Commission set an allowable of 6,000 bbl. for the first 30-day testing period for the new field.

ARKANSAS SUCCESSFUL WILDCAT

Lafayette County: Austin E. Stewart et al 1 Moore Estate, C NW SE 14-16s-25w, discovery well, gaged 248 bbl. of oil per day through 1/16-in. tubing choke from Glen Rose at 4,108-4,118 ft. and Kilpatrick lime at 4,142-4,150 ft., 36.5° gravity; Nacatoch 1,886 ft., Saratoga 2,280 ft., Base Annona 2,647 ft., Buckrange 2,754 ft., Tokio sand 2,930 ft., Paluxy 2,980 ft., Massive anhydrite 3,935 ft.

ARKANSAS WILDCAT FAILURES

Drew County: C. A. Kinard 1 George Reinhart, C NE SW 22-13s-6w, dry, TD 4,191 ft., Midway 2,730 ft., Arkadelphia 3,388 ft., Nacatoch 3,538 ft., Paleozoic 4,185 ft.

Ouachita County:: Lion Chemical Co. 1 Curry, NE SE SE 33-14s-19w, dry, TD 2,140 ft., Nacatoch 1,424 ft., Saratoga 1,696 ft., Base Annona 1,971 ft., Buckrange sand 2,078-85 ft.

NORTH LOUISIANA SUCCESSFUL WILDCATS

DeSoto Parish: Phillips Petroleum Co. 1 Nabors, C SW SE 28-12n-14w, produced

(Continued on page 168)

MISSISSIPPI

Increased Activity Reported In Brookhaven Field

JACKSON.—Brookhaven Field in Lincoln County is leading an increased activity in oil and gas exploration in Mississippi, with 17 active operations under way in the area and 9 locations being prepared for drilling. Sun Oil Co. 1 Leon Case, 17-7n-7e, south offset to the field extension well, had oil shows in the Case sand at 10,302 ft. and was preparing to drill ahead to 11,000 ft., or to the lower Cretaceous.

In the same county, 8 miles east of Auburn, an important wildcat test, Roeser & Pendleton, Inc., 1 Columbus Lumber Co., 20-6n-6e, has been drilled to 10,163 ft. in shale. Sidewall cores were taken in Wilcox at 4,046 ft. with no show of oil.

In LaGrange Field, Adams County, Sohio Petroleum Co. is discontinuing testing its 1 Baker-Maier, a discovery well, and is preparing to test Wilcox shows at 6,213 ft. Perforations at 6,206-08 ft. and 6,254-56 ft. will be squeezed preparatory to perforating the

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sand section to be tested. The 1 Baker-Maier logged sand at 6,220-56 ft. in which side-wall samples had a good odor and taste but only a slight stain.

MISSISSIPPI WILDCAT FAILURE

Clarke County: J. H. White 1 M. Eddins, NW NW 19-2n-14e, dry, TD 5,985 ft., Wilcox 708 ft., Midway 2,672 ft., Tuscaloosa 4,746 ft., Marine Tuscaloosa 5,558 ft., Davis sand 5,696 ft., Massive sand 5,861 ft.

ALABAMA WILDCAT FAILURE

Clarke County: The California Co. 2 White City Plantation, NE SE 12-7n-1w, dry, TD 3,845 ft., no tops reported.

KANSAS

Pratt County Wildcat May Open New Field

THE Lion Oil Co. appears to have opened a new oil pool in Pratt County at the 1 Chance, NW 4-27-13w, 2 miles northwest of the Iuka pool. At a total depth of 4,485 ft. in the Arbuckle, the well showed about 3 bbl. of oil an hour following initial light acid treatment. Following a second treatment production increased to 6 bbl. per hour.

In Ellis County J. C. Foley et al 1 Wiesner, SE SE SE 26-13-20w, logged a showing of free oil in the Arbuckle, topped at 3,800 ft., and is preparing to test. The well is more than a mile northeast of production in the Pleasant pool and about 6 miles southeast of the city of Ellis.

Three new extensions were reported in the Kansas fields during the past week, the first being the Amerada 1 Schultb, NE NW NE 8-19-15w. The 1 Schultb is a top potential well of 3,000 bbl. daily from the Regan sand and extends the Merten West pool about ½ mile to the west.

Meanwhile the Stelbar Corp. is extending the Wellington chat pool of Sumner County ½ mile to the northwest at the 1 Bean, 20-31-1w. Saturation was encountered in the chat at 3,664-3,702 ft.

Another important strike during the week was the Ruth Lane et al 1 Steinforth, SW SE NE 13-26-14e. The Steinforth gives the Batesville pool of Woodson County a long extension to the south. Bartlesville sand was topped at 1,233 ft. and hole was full of oil when testing started.

KANSAS SUCCESSFUL WILDCAT

Sedgwick County: Kingwick Oil Co. 1 Bartholomew, SE SE SW 30-27s-4w, produced 5,000,000 cu. ft. of gas from Mississippi lime at 3,694-3,736 ft., Lansing-Kansas City 2,875 ft., TD 3,737 ft.

KANSAS WILDCAT FAILURES

Barton County: Keyes Drilling Co. 1 Hagen, C S/2 SW NE 34-20s-11w, dry, TD 3,351 ft., Topeka 2,664 ft., Lansing-Kansas City 3,069 ft., Basal Kansas City 3,308 ft., Arbuckle 3,320 ft.

Sohio Petroleum Co. 1 Schneweis, SW SW NE 31-17s-11w, dry, TD 3,385 ft., Lansing-Kansas City 3,059 ft., conglomerate 3,324 ft., Arbuckle 3,360 ft., with a slight show of oil at 3,365-70 ft.

Pawnee County: Sohio Petroleum Co. 1 Schnack, SW SW NW 11-23s-17, dry, TD 4,400 ft., Lansing-Kansas City 3,748 ft., conglomerate 4,164 ft., Viola 4,244 ft., Simpson 4,326 ft., Arbuckle 4,367 ft.

Rice County: Iron Drilling et al 1 Hoyt, SE SE SW 24-19s-9w, dry, TD 3,432 ft., Lansing-Kansas City 2,910 ft., Basal Kansas City 3,210 ft., Maquoketa 3,233 ft., Viola 3,289 ft., Simpson 3,340 ft., Arbuckle 3,399 ft.

Phil-Han Oil Co. 1 Schoonover, SE SW SW 21-18s-9w, dry, TD 3,258 ft., Lansing-Kansas City 2,886 ft., Basal Kansas City 3,238 ft. with a show of oil at 3,242-44 ft.

Rooks County: Continental Oil Co. 1 Graham, NE NE NW 29-9s-20w, dry, TD 3,956 ft., Lansing-Kansas City 3,565 ft., Arbuckle 3,907 ft.

NEBRASKA WILDCAT FAILURE

Sioux County: Amerada Petroleum Corp. 1 Federal Geiser, C SW SE 10-34n-54w, dry, TD 4,561 ft., no tops reported.

OKLAHOMA

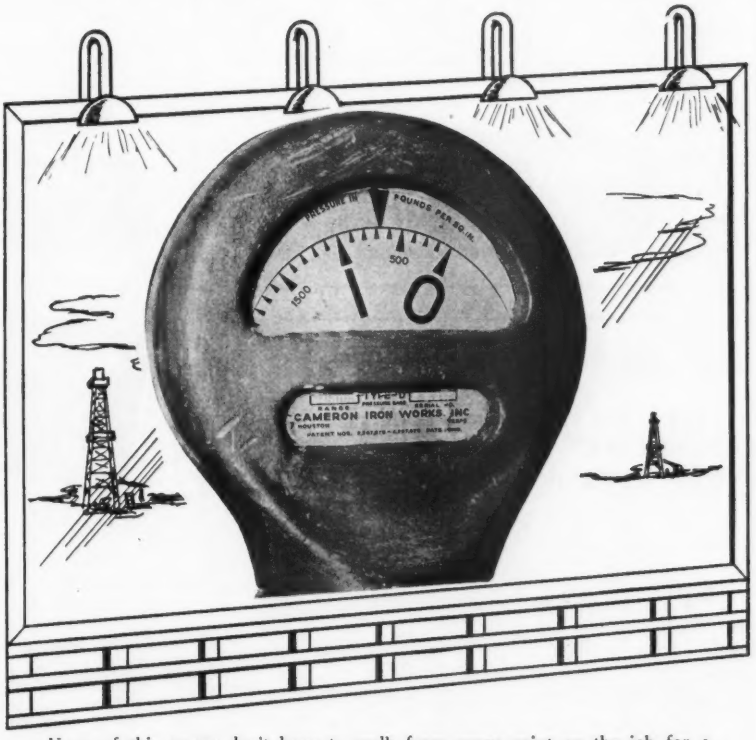
Two Wildcats in Anadarko Basin Flowing Oil

THE deep Anadarko Basin area continued to furnish the outstanding developments as the week opened with two wells flowing high-gravity oil after showing earlier for distillate production. One of the wells opens a new pool in McClain County while the other opens production from a new sand in the Chitwood pool of Grady County.

The Magnolia Petroleum Co. 1 Spiers, SW SW 28-5n-6e, Grady County, showed for better than 45 bbl. of 45°-gravity oil per hour on a drill-stem test at the close of the past week after operators were successful in shutting off salt water that had spoiled earlier efforts to test the Wilcox sand. Test was of a sand logged recently and which was perforated with 48 shots from 11,720-36 ft. Packer was set at 11,630 ft. and a 7,500-ft. water cushion was used. With a ½-in. opening on the tool, the well blew air immediately, started water out in 10 minutes, had gas in 24 minutes, and was making oil and gas at the end of 28 minutes.

The well was drilled to 11,865 ft. and has been preparing to test for about the past 10 days. Operations were delayed when a

Like Reading A Billboard



Users of this gauge don't have to walk from every point on the job for a close-up look . . . nor strain their eyes to make out miniature figures . . . nor squint at a jittery dial to get a pressure reading. They read, at a glance, the billboard figures and large scale divisions on a clear, steady dial through a colorless, unbreakable plexiglass face from distances of 30 feet or more. It's easy to keep a constant record of your mud, water, oil or gas line pressure with the Cameron Pressure Gauge. That's why it so quickly won worldwide acceptance.

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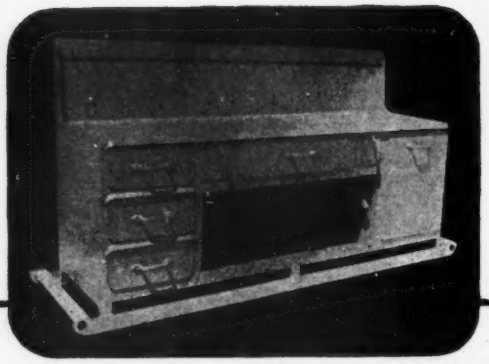

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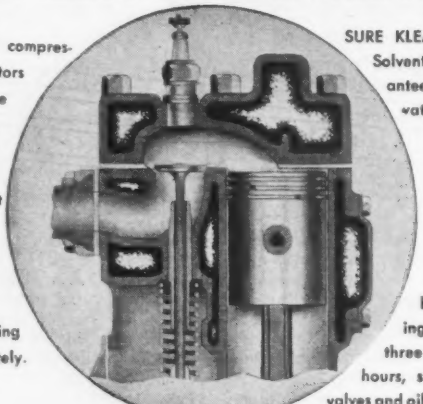

SURE KLEAN Scale Solvent is guaranteed to clean water jackets, remove scale and rust from radiators and blocks by dissolving. Stops, in three to four hours, sticking valves and oil sludging.

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Close Differential

The V-25-1 Gas-Fuel Governor, available in 3/8" to 3" i.p.s., will throttle gas lines according to boiler pressure desired. The V-25-1 series is suitable for control of liquified petroleum gas, natural, and manufactured gases.

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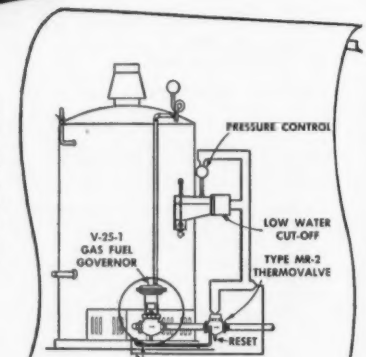

Low water, over-pressure and pilot-flame failure control can be obtained by use of V-25-1 Governor, and P G Type MR-2 Thermovalve This should suggest many other over-limit or safety control applications.

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portion of a setting tool had to be fished out.

The new Pennsylvanian sand pool opener in McClain County is the Big Chief Drilling Co. 1 Stephens, SE SW 24-5n-2w, near Wayne. Following perforations at 6,540-58 ft., the well was washed in and first flow was distillate at the rate of about 4 bbl. per hour. Later the well started making oil and flowed 286 bbl. in 13 hours through a ¼-in. choke. Gravity of the crude was 42°. Gas was measured at 970,000 cu. ft. daily for a gas-oil ratio of 200 to 1.

OKLAHOMA SUCCESSFUL WILDCATS

Creek County: Nabob 1 Meadors, SE SE NE 6-15n-7e, discovery well, pumped 35 bbl. of oil per day from Wilcox at 3,920-60 ft., no tops reported, TD 3,960 ft.

Garfield County: Ross Porter et al 1 Seigle, NE SE SW 32-23n-4w, discovery well, pumped 50 bbl. of oil per day from Wilcox at 6,045-65 ft.; Oswego 4,955 ft., Mississippi lime 5,426 ft., Viola 5,880 ft., dolomite 5,970 ft., TD 6,121 ft.

Lincoln County: Texola 1 Strough, SW SW SW 11-15n-5e, discovery well, pumped 30 bbl. of oil per day from Inola and Bartlesville at 3,670-80 ft., 35° gravity, Cleveland 2,577 ft., Oswego 3,239 ft., Verdigris 3,340 ft., Woodford 4,123 ft., Hunton 4,165 ft., TD 4,174 ft.

Pontotoc County: Texas Co. 1 Gray, NE SE SW 18-4n-5e, flowed 650,000 cu. ft. gas per day from sand at 905-15 ft., TD 3,249 ft.

Stephens County: Amerada Petroleum Corp. 4 Thompson, SE NW NE 19-1s-5w, new pay zone, flowed 499 bbl. of oil per day through 1-in. tubing choke from sand at 2,618 ft., 36.6° gravity; Hoxbar 1,510 ft., Deese 2,235 ft., TD 4,075 ft.

OKLAHOMA WILDCAT FAILURES

Coal County: Tibbens Oil Co. 1 William Curry, SE SE NW 18-13n-9e, dry, TD 4,191 ft., Bartlesville zone 2,845-78 ft., Booch 3,051-3,100 ft., Mississippi lime 3,600 ft., Woodford 3,742 ft., Hunton 3,845 ft., Sylvan 3,852 ft., Viola 4,135 ft., Wilcox 4,190 ft.

Creek County: Texola Drilling Co. 1 J. Harper, NW NW NW 8-14n-8e, dry, TD 2,589 ft., Cleveland 1,480 ft., Oswego 2,325 ft., Prue sand 2,430 ft., Verdigris 2,435 ft., Skinner zone 2,520-89 broken with a slight show of oil.

Garvin County: Lausen & Dixon 1-A Freeman, NW NW NE 36-1n-1w, dry, TD 2,860 ft., sand 1,270-1,300 ft., sand 1,732-50 ft. with a show of oil, sand 2,195-2,210 ft. with a show of oil.

Mid-Continent Petroleum Corp. 1 W. C. Menefee, SE SE SE 2-4n-2w, dry, TD 7,290 ft., Basal Pennsylvanian 5,788 ft., Viola 5,810 ft., Bromide dense 6,110 ft., first sand 6,275 ft., second sand 6,341 ft.

Sohio Petroleum 1 Parkey, SW NW NE 14-4n-1e, dry, TD 4,460 ft., Checkerboard 3,390 ft., Lower Checkerboard 3,590 ft., Viola 4,049 ft., Bromide dense 4,210 ft.

Logan County: British-American Oil Produring Co. 1 Terhune, SW SE NW 17-18n-4w, dry, TD 4,852 ft., sand 4,099-4,106 ft. and 4,132-52 ft., Layton 4,735 ft., 4,745 ft., and 4,818-45 ft.

Noble County: Clark & Cowden Drilling Co. et al 1 Clark, SE SW SW 32-21n-1w, dry, TD 5,441 ft., sand 4,020 ft., Big lime 4,330 ft., Oswego 4,430-4,675 ft., Woodford 5,202 ft., Sylvan 5,260 ft., dolomite 5,345 ft., Wilcox 5,402 ft.

McClure to Speak at Picnic

MOUNT VERNON, Mich. — H. M. McClure, Alma, Mich., president of the National Stripper Well Association, will speak at a stag picnic and golf tournament to be held here September 5 under the sponsorship of the Illinois Oil and Gas Association and the Illinois Basin chapter of the American Petroleum Institute.

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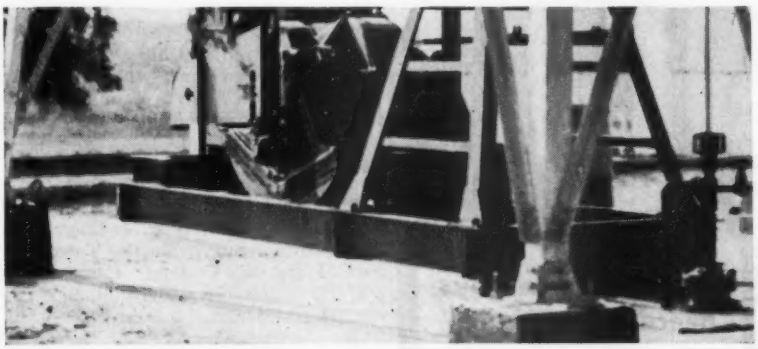

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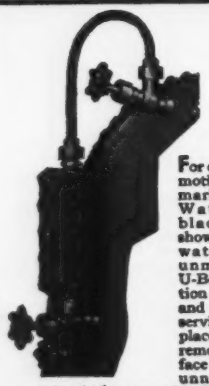

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Among the

Drilling Contractors

H & M Drilling Co., Leon, Kans., have spudded in at a test for Dave Alter, C. W. Brakensiek et al of Wichita, in the NE NE NW 22-28-3e, Butler County, Kansas, on a block of 320 acres. Location is approximately ¾ mile from J. P. Gaty's new Simpson producer in Section 23.

California Commercial Drilling Co., Los Angeles, has all four of its rigs idle temporarily while waiting for delivery of pipe to one of the large operating companies. The contractor recently completed four wells for Barnsdall Oil Co.

Hoosier Drilling Co. will deepen the 1-D Dempewolf, in NE NE NE 18-P-27, Henderson County, Kentucky, with cable tools. Old total depth was 2,015 ft. Location is west of the old Birk City pool of Henderson and Owensboro counties.

Newton Barrett Drilling Co. and E. H. Van Patten have commenced work at their 1 Campbell, SE SE SE 28-8n-7e, in the Little River area of Seminole County, Oklahoma.

Thomas P. Pike Drilling Co., Los Angeles, has been engaged to drill The Texas Co. 1 Westpet, a wildcat in Kern County, California, about 3 miles south of the Cymric pool. The location is 1½ miles south of McKittrick. Projected depth is about 8,000 ft.

B. G. Byars Drilling Co., Tyler, Tex., holds contract for Humble Oil & Refining Co.'s 16 P. J. Dawson, in J. Brantley Survey in the Talco field of Franklin County, East Texas. Work is under way with surface casing set at 349 ft.

O. A. Walter, Oklahoma City, will drill the 1 Mattie Watts, SE NE 4-17n-2w, Logan County, Oklahoma, for Harper-Turner Oil Co. Location is some 3 miles west and north of the Guthrie pool on a block of 2,000 acres. The wildcat, which will try for the second Wilcox, is supported by Magnolia Petroleum Co., Sunray Oil Co. and Olson Drilling Co. Work was reported under way last week.

Houser & Campbell have the contract for Sunray Oil Corp.'s wildcat in Starr County, Texas, less than a mile from the Rio Grande and some 5 miles southeast of the Rio Grande City and El Tanque pools. Location has already been staked in the center of Lot 23, B&B Survey, Portion 87, in the southern part of the county. Contract depth is about 3,300 ft., or to the Government Wells sand.

Burton & Burton Drilling Co., Ltd., Bakersfield, Calif., is rigging up rotary to drill Amaploa Oil Corp. 1 "Well," CSW 6-6n-12w, in the Lancaster area, Los Angeles County.

Olsen-Blount Drilling Co. skidded in derrick last week for Culbertson & Irwin's 1 Russell in NE SE 18-24s-37e, of the Langlie-Mattix area of Lea County, New Mexico.

Sam Tennant Drilling Co., Blackwell, Okla., was coring at 3,106 ft. on the Waldschmidt farm in the SE SE SW 15-28n-3e, 5 miles east of New-

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RECTORSEAL
THE POSITIVE LEAK PREVENTER

kirk in Kay County, Oklahoma, for the Burress-Morrow Co. of Oklahoma City.

Parker Drilling Co., Tulsa, will drill Barnsdall Oil Co.'s 1 Stuart, SW SE 12-14s-23w, a wildcat southwest of Bodcaw in Nevada County, Arkansas. Contract depth is 5,000 ft., or to the Smackover. Operators were moving in rotary rig on last report.

Fain & Riner's 1 D. C. Fritz, Section 46, Block 45, H&TC Survey, Baylor County, Texas, set surface casing and was waiting on cement on last report. The wildcat will go to 2,000 ft.

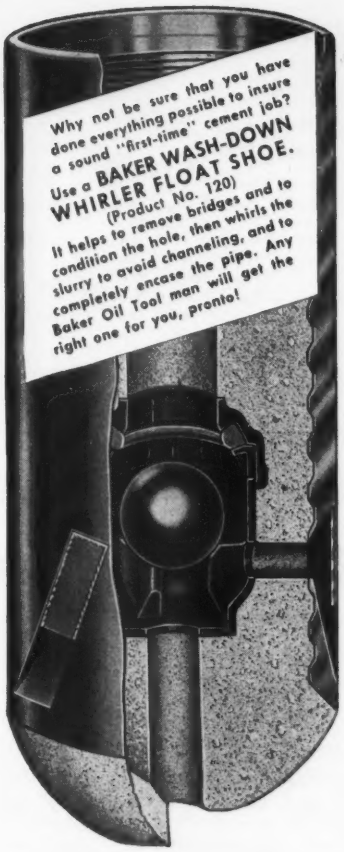
Delta Drilling Co. was reported below 4,825 ft. in shale at its 1 Christian Unit, in A. T. Nichols Survey A-518, Panola County of East Texas.

Olsen-Blount Drilling Corp., Oklahoma City, last week skidded derrick and moved in tools at Culbertson & Irwin, Inc.'s 1 Russell, NE SE 18-24s-37e, in the Langlie-Mattix field, Lea County, New Mexico. The same operators' 2 Andrews, NW SE 18-24s-37e drilled plug and cleaned out after setting 5-in. oil string at 3,450 ft.

Conway Drilling Co. has contract for Frank J. Podpechan and A. C. Adamson's 1 Sabine Lumber Co., in NE NE 23-7n-14w. Location is in the Blue Lake field of Sabine Parish, Northern Louisiana. Contract depth is 4,000 ft.

LEGAL

U. S. DEPARTMENT OF THE INTERIOR, Bureau of Land Management, Washington 25, D. C. Notice is hereby given that sealed bids will be received until 1 p. m. Wednesday August 28, 1946, for land described herein situated within the known geologic structure of the Kevin-Sunburst oil and gas field, Montana. This land is offered to qualified bidders of the highest cash amounts per acre as a bonus for the privilege of leasing the land under section 17 of the leasing act as amended by the Act of August 21, 1935 (49 Stat., 674, 30 U.S.C. sec. 226) in the following parcels: Parcel No. 1, T. 34 N., R. 2 W., sec. 3, lot 4, SW¼NW¼, NW¼SW¼, 120.12 acres. Parcel No. 2, T. 35 N., R. 2 W., sec. 8, E½NE¼, 80 acres. Parcel No. 3, T. 35 N., R. 2 W., sec. 17, W½NE¼, 80 acres. Total 280.12 acres. Bids must be submitted on each parcel separately, but if two or more parcels are awarded to the same bidder they may be included in a single lease. Each bidder must submit with the bid one-fifth of the amount bid in cash, or by certified check made payable to the order of the Treasurer of the United States, and file the showing of qualifications to receive a lease required under 43 CFR 192.19. The envelopes should be plainly marked, "Bid for Parcel No. 1, Kevin-Sunburst oil and gas field. Not to be opened before 1 p. m. August 28, 1946." No bids received after the hour fixed herein for receiving bids will be considered. The remainder of the bonus and the annual rental at the rate of $1 per acre must be paid and a $5,000 corporate surety bond must be furnished by a successful bidder prior to the issuance of a lease. The deposits of the other bidders will be returned upon acceptance of the successful bids. The successful bidder will be required to agree not to discriminate against any employee or applicant for employment because of race, creed, color, or national origin, and to require an identical provision to be included in all subcontracts. Bidders are warned against violation of section 59, U. S. Criminal Code, approved March 4, 1909, prohibiting unlawful combination or intimidation of bidders. The right is reserved to reject any and all bids. Fred W. Johnson, Acting Director.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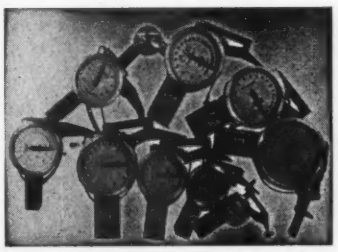

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PERSONALS

Bond Named to New Production Post With Shell

APPOINTMENT of Reid W. Bond to a newly created post of production director was announced last week in Houston by A. J. Galloway, vice president in charge of Shell Oil Co.'s exploration and production activities east of the Rockies. In his new position, Bond will coordinate the company's production activities east of the Rockies and will be located in the office of the vice president in Houston.

Bond has just returned from the Army where he served 40 months overseas—2 years on General MacArthur's staff in Australia and New Guinea, handling transportation and supply problems, and from early 1944 held a command in the Philippine operations. He participated in five campaigns, including several landings, and for outstanding service received the Legion of Merit and Bronze Star with Oak Leaf Cluster. At the time of his release, he held the rank of colonel.

A graduate of the University of Pittsburgh's mining engineering school, Bond was production manager for the company's Mid-Continent area at the time of his entry into the service in March 1942. He has had 21 years of experience with Shell and was largely responsible for development of portable drilling methods which resulted in substantial savings in the company's Kansas and Illinois drilling campaigns.

Leonard A. Toone, former manager of Anglo-Egyptian Oilfields, Ltd. (Shell) in Cairo, is being transferred to another Shell interest, Caribbean Petroleum Co., and will become operations manager in Caracas. Currently, Toone is in New York taking a rest before assuming his Venezuelan duties.

Earl E. Willauer, process division employe of Standard Oil Development Co., has been appointed safety engineer succeeding **Frank S. Proctor.**

Ray Rossman and **George Duffy,** chemical engineers of Cabot Carbon Co., have been transferred to Pampa, Tex., from the Boston laboratories.

Luther Bell has been advanced from drilling superintendent to production superintendent for Fain-McGaha Drilling Co., Inc.

Clarence Norman, Carter Oil Co. chemical engineer, has been assigned to the St. Elmo, Ill., natural-gasoline plant after 4 years in the Army. At the time of his separation from the service he held the rank of major.

W. M. Roberts, San Francisco, has been appointed manager of the recently created labor-relations department, Standard Oil Co. of California. For the past 12 years, Roberts has been engaged in employe-relations work for Standard of California which he has served for 27 years.

K. D. Legget, station engineer for Shell Pipe Line Corp., has been transferred from Goodrich, Tex., to Kilgore, Tex. **T. J. Patterson,** former tank farm gager at Deer Park, Tex., will succeed him. **J. M. Welch,** utility oiler at Osage, Tex., has been promoted to station engineer at Fairland, Tex.

Robert M. Lee has been appointed manager of the new industrial relations and personnel departments recently set up in Shell's coastal area. **Howard F. Garity** and **Lemoyne Porter** will head the new departments in the Los Angeles Basin and San Joaquin areas, respectively. **M. W. Sheppard, Jr.,** former assistant to the vice president, has been appointed manager of oil property purchases. **E. A. Romer** Shell's Martinez refinery superintendent, has been transferred to San Francisco as manager of operations in the manufacturing department. **John A. Tench,** former manager of operations, succeeds him at the refinery.

F. M. Rogers, chief chemist at the Whiting Laboratories of Standard Oil Co. (Ind.), has retired after 38 years with the company.

K. S. McMahon, tutor of chemical engineering at the University of Texas, has been awarded a scholarship for graduate study by Gulf Oil Corp.

Wilfred J. Stuckey, Royalite Oil Co., left recently by plane for Bogota, Colombia, to join International Petroleum Co.

Edward M. Howard, former Navy commander with the Seabees in the Pacific, has been named New England district engineer for the Asphalt Institute.

Frank C. Greene, member of the Missouri Geological Survey staff, will leave shortly on a 2-month trip to Italy to do oil and gas exploration work.

M. K. McFarland and **T. A. Hester,** Oklahoma Contracting Co., Dallas, are in Venezuela studying the proposed Paraguana-Lake Maracaibo pipe-line project for Creole Petroleum Co. in preparation for submitting bids on the line.

Earl Weaver, formerly administrative assistant in the personnel department of Ashland Oil & Refining Co., has been appointed to the position of operations manager for the distributing division. He succeeds **W. H. Mock,** recently resigned.

Gerald E. Eddy has been named state geologist for Michigan, succeeding the veteran **Dr. R. A. Smith,** who retired. Eddy joined the state geology division in 1933 as an oil and gas geologist. Two years later he was transferred to Lansing as petroleum engineer. After Army service as a captain, he was discharged in March 1945.

Edward Hans Zeitfuchs, known for his work on the physical properties of petroleum products and inventor of a viscosity meter widely used in the oil industry, is retiring from California Research Corp., Standard Oil Co. of California subsidiary, after 25 years' service. Zeitfuchs, senior physical specialist for California Research at Richmond, joined Standard as a physicist in 1921.

Carl Bryant, Jr., maintenance helper of Lone Star Producing Co., has been promoted to production engineer.

Frank W. Abrams, chairman of the board of Standard Oil Co. (N. J.), has been elected a trustee of the National Planning Association.

Michael L. Benedum, president of Benedum-Trees Oil Co., has accepted appointment as an honorary trustee of Marietta College, Marietta, Ohio.

M. V. C. Bradley has been named general superintendent of the producing division, Magnolia Petroleum Co., Dallas, succeeding **E. N. Wilson,** who has retired due to ill health.

Charles Elste, Standard Oil Co. of New Jersey, has been promoted to general foreman of the Bayway refinery's electrical department at Elizabeth, N. J. **William H. Cox** and **Benjamin B. Cole** have been promoted to assistant general foreman, and **Howard B. Quinzel** to foreman.

W. C. Roberts who joined Shell Oil Co., Inc., as a pipe line dispatcher in 1916 and recently assistant pipe-line manager, has been advanced to manager of pipe lines succeeding **Fred B. Simms** who has retired after over 30 years' uninterrupted service with Shell's California division.

Chester L. May, vice president of Lone Star Gas Co., Dallas, has been named chairman of the Gas Industry Advisory Committee, Southern Gas Association, which will sponsor the gas technology short course at Texas A. & I. College, Kingsville, August 27-29.

Martin J. Gavin, formerly an official of the Petroleum Administration for War, is now in Caracas, Venezuela, with Caribbean Petroleum Co. (Shell). He will return to the United States shortly enroute to England and Holland on a business trip, following which his family will join him in Caracas.

Bernard Nicolaas Van Dieman de Jel, petroleum engineer and native of Holland, is studying conservation and pool reservoirs with Carter Oil Co. in Tulsa. He will return to Sumatra at the end of his stay. He spent 3½ years in a Japanese prison camp during the war.

Samuel A. Chadwell has been appointed to the newly created position of system dispatcher for Columbia Gas & Electric Corp. with headquarters at Charleston, W. Va. He has been superintendent of the gas control department of Ohio Fuel Gas Co. at Columbus. **Vance O. Cox,** chief dispatcher for Ohio Fuel Gas Co., will succeed Chadwell.

SHIFTS—

Robert E. Fields, engineer, Atlantic Refining Co., Seagraves, Tex., to Denver City, Tex.; **Jerry Holt,** superintendent, Noble Drilling Corp., Bowie, Tex., to Midland, Tex.; **O. L. Furse,** engineer, Humble Oil & Refining Co., Talco, Tex., to Overton, Tex.; **Louis E. Reynolds,** superintendent, Skinner & Eddy Corp., Alice, Tex., to Maryville, La.; **C. T. Riley,** superintendent, Superior Oil Co., Midland, Tex., to Andrews, Tex.; **N. N. Jones,** superintendent, Humble Oil & Refining Co., Overton, Tex., to Gladewater, Tex.; **Glenn C. Woolley,** geologist, Transwestern Oil Co., Jackson, Miss., to San Antonio; **Clifton L. McCown,** geologist, Bay Petroleum Co., Oklahoma City to Wichita, Kans.

J. L. O'Neil, drilling superintendent of South Penn Oil Co., has retired after 38 years' service. He joined the company in 1908 and rose from roustabout to superintendent. South Penn's drilling department has been disbanded and all drilling will be done by contractors, it was announced.

S. L. Westlake has been appointed superintendent of maintenance for Magnolia Pipe Line Co., succeeding A. R. Ehrardt, deceased. **D. E. White** succeeds Westlake as assistant superintendent of maintenance in Dallas. Other changes include **J. G. Norton,** who has been placed in charge of all equipment maintenance and mechanical work in Dallas, and **C. R. McKenney** who has been promoted to division machinist foreman for the central division at Corsicana, Tex.

Alvin B. Vanhooser has been appointed district superintendent in charge of Humble Oil & Refining Co. Imogene District near Pleasanton, Atascosa County, Texas. Vanhooser, with the company since 1919, was serving as district superintendent in Humble's Government Wells District before his transfer. Other recent changes in the supervisory force of Humble's production department: **Donnell O. Harvey,** promoted from farm boss in the Flour Bluff District to district superintendent of the Colorado District. **F. C. Horner,** district superintendent of the Colorado District, appointed district superintendent in charge of the Government Wells District. **E. E. Williams,** district superintendent of the Potash District, Point-a-la-Hache, La., transferred to Crowley, La., as district superintendent in charge of the North Crowley District. **J. S. Payne,** district superintendent of the Bayou Sale District, Franklin, La., has been transferred to New Iberia, La., as district superintendent of the Avery Island District. **E. M. Bedford,** district chief clerk in the Potash District, has been transferred to New Iberia, La., as district chief clerk of the Avery Island District.

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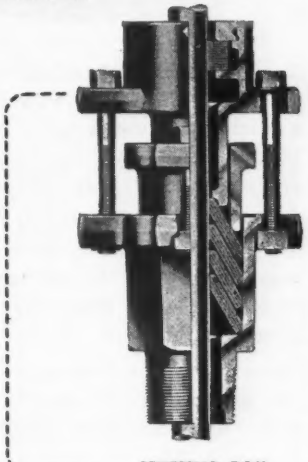

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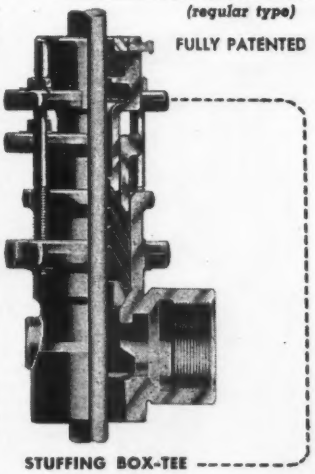

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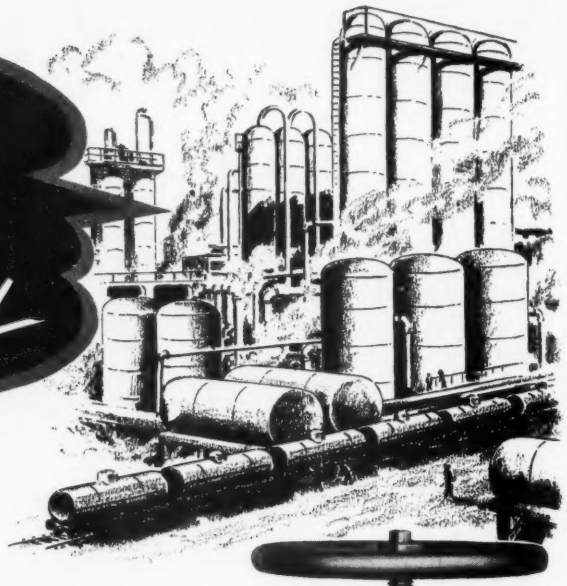

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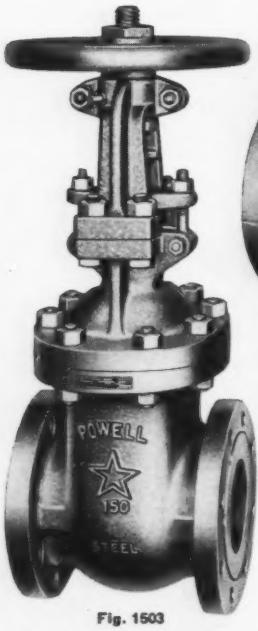

Fig. 1503

Fig. 1561

Fig. 1561—Class 150-pound Cast Steel Swing Check Valve with flanged ends and bolted cap. Disc, when wide open, permits full unobstructed flow through the valve body.

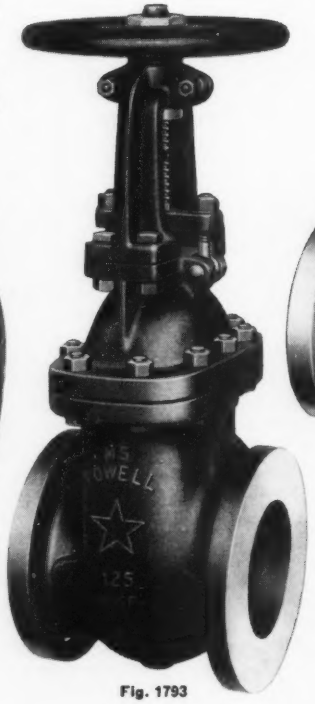

Fig. 1793

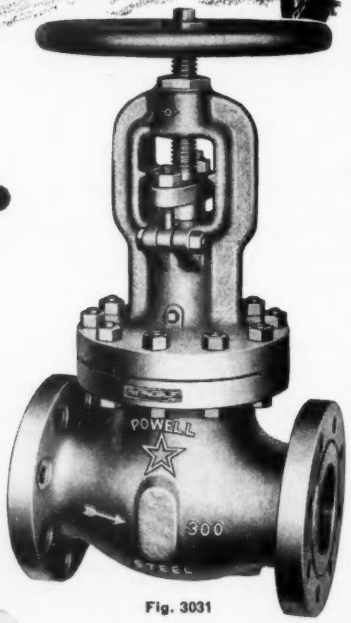

Fig. 3031

Fig. 1503—Class 150-pound Cast Steel Gate Valve. Has flanged ends, outside screw rising stem, bolted flanged yoke and taper wedge solid disc.

Fig. 1793—125-pound Iron Body Bronze Mounted Gate Valve with flanged ends, outside screw rising stem, bolted flanged yoke, bronze seat rings and taper wedge solid disc. Also available in All Iron.

Fig. 3031—Class 300-pound Cast Steel Globe Valve with flanged ends, outside screw rising stem and bolted flanged yoke.

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DISTRIBUTORS AND STOCKS IN ALL PRINCIPAL CITIES

POWELL VALVES

Equipment Men in the News

Marmon-Herrington Elects Four New Directors

Arthur W. Herrington, chairman of the board of directors of Marmon-Herrington Co., Indianapolis, has announced that David

KLAUSMEYER

C. A. CAMPBELL

G. C. DIXON

E. J. BREECH

M. Klausmeyer, C. Alfred Campbell, Guy C. Dixon, and Earl J. Breech were elected to the board of directors at a recent meeting of the stockholders.

Klausmeyer recently joined Marmon-Herrington as president, after 22 years with the Chevrolet Division of General Motors Corp. Both Campbell and Dixon have been associated with Marmon-Herrington for a number of years and are officers of the company, being vice president and treasurer respectively. Breech is general manager and treasurer of Merz Engineering Co., Indianapolis, wholly owned Marmon-Herrington subsidiary.

Porter Purchases Concern

H. K. Porter Co., Inc., announced recently the purchase of the business of American Spiral Spring & Manufacturing Co. of Pittsburgh. The new acquisition, together with the present Porter Fort Pitt Spring plant, will be operated as American-Fort Pitt Spring Division of H. K. Porter Co., Inc.

The new Porter expansion is in accordance with a previous established policy of developing the company's railway-supply and specialty business.

European Tour Planned

Dr. Emil Ott, director of research of Hercules Powder Co., and Eero Erkko, his technical assistant, are planning a 2-month tour to Europe which will include visits to England, Sweden, Switzerland, Holland, Belgium, and France. They will visit various chemical plants and talk with noted scientists, including experts in the field of cellulose chemistry.

Osgood Given Award

R. C. Osgood, chief engineer and manager of the Hoist division, received special recognition as a part of the naval Ordnance Development Award recently conferred on Sullivan Division of Joy Manufacturing Co. J. A. Drain, vice president in charge of engineering for Joy Manufacturing Co., was also given special recognition. The work of the late Alton Hilliard, assistant to Osgood during the many months of difficult engineering work, was recognized in a similar award to his widow.

Chicago Bridge & Iron Announces Changes

Charles S. Pillsbury has been elected executive vice president of Chicago Bridge & Iron Co. He is also a director of the firm. Pillsbury has been with the company since 1908. Leo J. Marcoux succeeds F. L. Grossman as controller of the company. He has been with the company since 1923. William Tam, superintendent of the company's Greenville plant, retired July 1 after 44 years of service.

Donoghue Named Safety Director Of Pittsburgh Plate Glass

Appointment of Thomas R. Donoghue as safety director for Pittsburgh Plate Glass Co. is announced by E. V. Ogg, director of industrial relations. Donoghue will have complete jurisdiction over the industrial safety program in the 26 plate and window glass, paint, chemical, cement, and brush plants operated by the company.

Ensminger Heads New Department Of Mathieson Alkali Works

H. ENSMINGER

The Mathieson Alkali Works has entered the fire-protection field with both high and low-pressure carbon dioxide equipment, it is announced by George W. Dolan, president. Charles T. Longaker, manager of Mathieson's carbon dioxide division, has named Harry Ensminger to head the fire-protection department, with headquarters at the company's New York offices.

Ensminger became affiliated with the Mathieson organization in 1945. Prior to that time, he held the position of sales manager of the electronics division of Federal Telephone & Radio and before that was sales manager for the Cardox Corp. for about 6 years.

Hoyt Joins Double Seal Ring Co.

The Double Seal Ring Co., Fort Worth, with branch factories in New York and Los Angeles, announces the appointment of R. W. Hoyt as assistant chief engineer. Hoyt is a mechanical engineering graduate of Purdue University. He has been employed 11 years by the Scintilla Magneto division of Bendix Aviation Corp., where he has been connected with the diesel fuel injection equipment program as assistant diesel engineer.

New Executive Named for National Tube Co.

John E. Goble, who worked his way up from an oil-field driller, has become president of National Tube Co. He succeeds Charles R. Cox, recently elected president of Carnegie-Illinois Steel Corp. Goble has been with U. S. Steel and with companies now affiliated with U. S. Steel for 21 years.

JOHN E. GOBLE

W. F. McCONNOR

William F. McConnor, general manager of sales of National Tube Co. since 1936, has been named vice president in charge of sales of this United States Steel pipe manufacturing subsidiary, to succeed Goble.

Chapman Named Chief Engineer Of Bowser Division

E. W. Chapman has been appointed chief engineer of the newly created industrial pump division of Bowser, Inc., with headquarters in Fort Wayne, according to an announcement by J. B. Trotman, general manager of the division. Chapman was formerly chief engineer of Blackmer Pump Co., Grand Rapids, and has been active in the pump industry for the past 15 years.

DeMouche in Mexico City For Hunt Companies

Hunt Tool Co., Houston, announces the appointment of W. Y. DeMouche as Hunt Tool Co. and Hunt Export Co. representative in Mexico City. DeMouche has opened an office at Paris 12, Mexico City, D. F.

Marquardt Heads Philadelphia Office

E. A. MARQUARDT

The opening of a new Philadelphia office of The General Detroit Corp. and The General Pacific Corp. is announced by E. A. Warren, vice president in charge of sales. Elmer A. Marquardt has been appointed zone sales manager in charge of the office at 1427 N. Broad Street.

Kelco Appoints New Distributors

Ben F. Kelley Co., Tulsa, manufacturers of Kelco safety equipment for the oil industry, has announced the appointment of two new distributors: Mrs. Lynn C. Holloway, Houston, covering South Texas, southern Louisiana and Mississippi, and S. C. Muratta, Fort Worth, distributor for North Texas, New Mexico, Arkansas, and northern Louisiana. These firms will handle Kelco spinning line and breakout catheads and mechanical pipe stabbers.

Shafer Joins National Radiator Co.

Dr. W. M. Shafer, until recently a member of the research and metallurgical staffs

of Fansteel Metallurgical Corp., North Chicago, Ill., is now with the research department of The National Radiator Co. Dr. Shafer was graduated from the University of Illinois and obtained a Ph.D. degree in chemistry and metallurgy from the same university.

Holmes to Represent Firm In Philippine Islands

Warren J. Holmes has been named export representative in the Philippine Islands for Allis-Chalmers Manufacturing Co., Milwaukee, and will work with Earnshaw Docks and Honolulu Iron Works, distributors of heavy industrial equipment for the firm's general machinery division. Prior to joining Allis-Chalmers in 1944, Holmes spent 2 years as consulting engineer with several firms.

Grant Named Treasurer of Caterpillar Tractor Co.

VIRGIL V. GRANT

Election of Virgil V. Grant as treasurer of Caterpillar Tractor Co., Peoria, is announced by L. B. Neumiller, Caterpillar president. Assistant treasurer of the company since early 1944, Grant succeeds W. J. McBrian as treasurer. McBrian has been Caterpillar treasurer since November 1938 and was elected a vice president in May 1944.

Stone Heads Division Office

Establishment of a branch division sales office in San Francisco by Oil Well Supply Co., a subsidiary of U. S. Steel Corp., is announced by Warner F. Parker, California division manager of the company.

The new office, located at 544-A Russ Building, will service foreign oil development by California producers, and, in addition, will handle the domestic needs of the oil industry in the north California and San Francisco Bay area. In charge of the new branch division office in San Francisco is Randall D. Stone.

Aurelius Succeeds Worthington

Marcus J. Aurelius has been elected sales vice president of United States Steel Supply Co., Leslie B. Worthington, president of this U. S. Steel subsidiary, has announced. Aurelius succeeds Worthington, who advanced from the vice presidency to the presidency of the supply company on July 15, upon the retirement of Ernest E. Aldous.

Smith Returns From South America

Jack S. Smith, general manager of International Cementers, Inc., has returned to New York following an extensive trip to Venezuela, Colombia, Ecuador, Peru, Mexico, London, Paris and Holland. Before returning to his home in California he visited Toronto.

Boyce Named Representative

The Calco Chemical Division, American Cyanamid Co., Bound Brook, N. J., has announced the appointment of W. M. Boyce as a southern representative calling on the paper and gasoline-refining industries for the Heller & Merz department.

New Building Purchased

In the future Ensign Carburetor Co.'s Chicago branch factory will be located in a modern building recently acquired and located at 2330 West 58th Street.

La.-Ark. Fields

(Continued from page 158)

39,000,000 cu. ft. of gas open flow from Pettit at 6,180-6,200 ft., discovery well, deeper zone in Spider, TD 6,684 ft.

Rapides Parish: Union Producing Co. 1 Belgard, SL NW NE NE 14-4n-3e, flowed 346 bbl. of oil per day through 3/16-in tubing choke, 46.3° gravity, from Tuscaloosa Massive sand at 9,684-9,700 ft., 9,714-22 ft., and 9,726-42 ft., deeper horizon in Big Island pool, Vicksburg 1,190 ft., Moodys Branch 2,412 ft., Cook Mountain 2,934 ft., Sparta 3,212 ft., Cane River 3,700 ft., Wilcox 3,928 ft., TD 12,010 ft.

Red River Parish: M. T. Halbouty 1 Sorill, SE NE NE 36-11n-10w, pumped 8 bbl. of oil per day from Nacatoch at 1,207-34 and 1,242-49 ft., discovery well, TD 1,277 ft.

NORTH LOUISIANA WILDCAT FAILURES

Caddo Parish: W. C. Feazel et al 1 S. L. Herold, C NW SW 21-15n-16w, dry, TD 6,719 ft., Blossom 1,930 ft., Tokio 2,114 ft., Austin 2,440 ft., Lower Cretaceous 2,540 ft., Paluxy 2,790 ft., Glen Rose 3,150 ft., Pettit 5,812 ft., Travis Peak 6,202 ft.

LaSalle Parish: Placid Oil Co. F-5 Tremont L. Co., C NW NE 14-9n-2e, dry, TD 7,120 ft., no tops reported.

Morehouse Parish: Pure Oil Co. 1 N. Robinson, C NE SE 17-23n-8e, dry, TD 3,700 ft., Sparta 510 ft., Wilcox 1,534 ft., Midway 2,215 ft., Cotton Valley 2,846, Smackover 3,397 ft.

Red River Parish: Carter Oil Co. 1 Bell Lumber, NW NE NW, 24-13n-10w, dry, TD 4,016 ft., top Nacatoch 1,061 ft., Base Annona 1,600 ft., Eagleford 2,661 ft.

Richland Parish: Pan-American Producing Co. 1 G. B. Franklin & Son, C SE NE 3-17n-8e, dry, TD 4,002 ft., no tops reported.

Illinois Fields

(Continued from page 157)

wildcats and 9 were wildcat failures. Of the 44 new operations announced during the week, 9 were wildcats. These were located one each in Jefferson, Coles, Effingham, White, Wabash, Clark, Lawrence, Gallatin, and Perry counties.

ILLINOIS SUCCESSFUL WILDCATS

Washington County: National Consumers, Inc., 1 Koelling-Pitchford, NW SW SE 10-2s-1n, pumped 31 bbl. of oil, Cypress sand 1,520-27 ft., TD 1,532 ft.

White County: Vic & Van 1 Hon, NW SE SW 33-3s-10e, pumped 93 bbl. oil and 100 bbl. water, potential 63 bbl. oil and 63 bbl. water, Cypress sand 2,975-84 ft., TD 3,330 ft.

ILLINOIS WILDCAT FAILURES

Clinton County: E. J. Goldschmidt, 1 Winkler, SW SW NE 24-1n-4w, dry, TD 1,102 ft., Bar lime 900 ft., Cypress 947 ft., Benoist 1,067 ft.

Jefferson County: K. M. Bayer 1 Rainey, SE NE SW 26-2s-2e, dry, TD 2,845 ft., Bar lime 2,369 ft., Benoist 2,546 ft., Aux Bases 2,624 ft., Ste. Genevieve 2,685 ft., McClosky 2,765 ft.

Collins Bros. 1 Gaines-Glick, SE SW SW 5-3s-4e, dry, TD 3,169 ft., Bar lime 2,698 ft., Aux Vases 2,968 ft., Ste. Genevieve 3,030 ft., McClosky 3,075 ft.

Lawrence County: Joe Young, Jr., 1 Walker, SW NW NE 13-3n-11w, dry, TD 1,904 ft., Cypress 1,723 ft., Aux Vases 1,732 ft., Ste. Genevieve 1,778 ft., McClosky 1,802 ft.

Madison County: J. McGovern et al 1 Bandert, NW SE NE 20-5n-8w, dry, TD 1,225 ft., Louisiana lime 1,102 ft., Devonian 1,198 ft.

Marion County: D. J. McDeritt 1 Ford, NW NW SE 10-3n-3e, dry, TD 2,489 ft., Aux Vases 2,303 ft., Ste. Genevieve 2,411 ft., McClosky 2,436 ft.

Washington County: Powell & Rea 1 Symond, SE NW SE 33-3s-1w, dry, TD 1,353 ft., Cypress sand 1,226 ft., Benoist 1,347 ft.

Wayne County: National Oil Co. 1 Pike, SW SW SE 9-1s-7e, dry, TD 3,249 ft., Aux Vases 3,140 ft., Ste. Genevieve 3,201 ft., Fredonia 3,245 ft., McClosky 3,246 ft.

Brinkerhoff Drilling Co. 1 Clevenger, SW SE NE 7-1s-9e, dry, TD 3,340 ft., Bar lime 2,880 ft., Benoist 3,075 ft., Ste. Genevieve 3,224 ft.

California Fields

(Continued from page 141)

cations by Krieger Oil Co. in the Cat Canyon field, Santa Barbara County, representing the largest concentration of new work. Deepening and redrilling work continues to be concentrated chiefly in the Wilmington field where additional wells are to be carried to Zone 237 and the conglomerate-schist producing levels.

CALIFORNIA SUCCESSFUL WILDCATS

Ventura County, Del Valle: Superior and British-American 4 Black, 13-4n-18w, 85 bbl. daily, 23.8° gravity oil, TD 3,226 ft.

Kings County, Trico area: Standard of California 1 Discombe Community, 1-24s-22e, TD 4,125 ft., PB 3,831 ft., perf. 2,470-2,570 ft., I.P. 10,890,000 cu. ft. gas, ¾-in. choke, SI pressure 1,076 psi.

CALIFORNIA WILDCAT FAILURES

Solano County, Maine Prairie: Amerada Petroleum Corp. A-1 Crocker, 25-6n-2e, dry, TD 4,850 ft.

San Joaquin County, McDonald Island: M. R. M. Syndicate 2 Pacific States, 1-1n-4e, Nortonville Green sand 4,420 ft., Domengine 4,550 ft., Capay shale 5,224 ft., McDonald sand 5,345 ft., dry, TD 5,409 ft.

Fresno County, Jacalitos area: Standard Oil Co. of California 54 Ferguson, 6-22s-16e, dry, TD 7,782 ft.

Southwest Texas

(Continued from page 152)

H. R. Smith and Skinner & Eddy 1 Schumann, is preparing to run a drill-stem test after perforating at 3,786-94 ft. in the Wilcox for completion. This well was drilled to a total depth of 3,813 ft. and set 5½-in. casing at 3,813 ft. after coring approximately 55 ft. of oil sand.

Lyon & Prentiss 2 M. P. Holchak, Pettus sand test on north flank of Boyce field production, in Goliad County, was completed dry at total depth of 4,260 ft. in the Pettus sand. On a drill-stem test at 4,251-60 ft. open 20 minutes, operators recovered 90 ft. of oil-cut mud with 600 lb. working pressure. The Pettus sand was found to be very shaly and nonporous.

One new gas pool was completed this week in Duval County while the other two wildcats drilled were dry, one each in Bexar and Zapata counties. Falls City and Seeligson fields each received three new locations, Refugio, Heard and Lolita reported 2. Four wildcat locations were reported, one each in Caldwell, Duval, Kleberg and Zapata counties.

SOUTHWEST TEXAS SUCCESSFUL WILDCAT

Duval County: New gas pool—Edwin B. Cos and Jake L. Hamon 1 Leila Peters, BS&F Sur. 194, 14 mi. SW of Freer, 1 mi. SE of East Peters field, top pay 2,612 ft., TD 2,700 ft., perf. 24 holes 2,612-18 ft., PT 8,500,000 cu. ft. gas per day on open flow, dry gas, shut-in pressure 830 lb., no water.

SOUTHWEST TEXAS WILDCAT FAILURES

Bexar County: H. S. Stahl 1 Clemens Koehler, N. Montoya Sur. 21, 6 mi. E of San Antonio, dry, TD 852 ft.

Zapata County: F. C. Vollerming 1 Robert Hinnant et al, Block 48, Sur. 613, 20 mi. S of Mirando City, dry, TD 1,707 ft.